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Title: Cross Sections for MCNP Version 4

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# Los Alamos

Los Alamos National Laboratory  
Los Alamos, New Mexico 87545

# memorandum

TO: R. C. Little, X-6, MS B226  
FROM: R. E. Seamon, X-6 *RHS*  
SYMBOL: X-6:RES-90-294  
SUBJECT: Cross Sections for MCNP Version 4

DATE: 17-May-1990  
MAIL STOP/TELEPHONE: B226 / 7-4809

*Can Judi, I have XSLIST  
cross sections at T=1000 K,  
2750°K.*

## INTRODUCTION

Judi Briesmeister came to me seeking help in revising the MCNP Manual (Ref. 1) for Version 4 of the code. She wants to bring the cross-section information in the Manual up to date. Our discussions started with Table G.2 of the Manual – how we needed to add the multigroup cross sections, to add the cross sections on EPRIXS, and to delete the obsolete cross sections. This led to suggested changes in the text all throughout the Manual. Unfortunately, I do not have a record of all those changes. At your suggestion, I started with the “living” version of Table G.2 which you maintain on CFS under /X6XS/CTSS/XSLIST; many of the required changes had already been made by you on that file. I have a new version of XSLIST stored on CFS under /076997/MYREDSTUFF/XSLIST. A listing thereof is attached as Appendix A. In this memo I want to talk about the changes suggested for XSLIST and to solicit your aid in completing the task before the file is turned over to Judi. I shall outline other tasks awaiting completion in this Version 4 project; perhaps you’ll see other areas I have overlooked.

## CHANGES TO XSLIST

On page 12 of the MCNP3B Newsletter (Ref. 2) of July 18, 1988, we state our intention to delete cross sections from ENDF/B-III, ENDL73, ENDL75, ENDL76, and LAMDF. Users were warned of our plans to do so back in the July, 1986 MCNP Cross-Section Newsletter (Ref. 3). It is time to carry out this plan.

I have removed from XSLIST all the lines corresponding to the entries in Table II of Ref. *✓* 3. I have also deleted ZAIDs = 6012.04C and 26000.03C, the former being the special carbon cross-section set with angular distributions from W. Webster of Livermore, the latter being the special DNA version of the iron evaluation specified correctly as MAT=4180 Mod 2. When these changes are effected, it is necessary to remove He-NAT and B-NAT as categories from XSLIST. Here is a little summary showing the number of ZAIDs of importance remaining on the various principle files:

*1576352 in MYREDSTUFF/XDXFL*

*has the atomic weights  
up front*

File	ZAIDs Before	ZAIDs After	
XMCCS	62	21	
AMCCS	36	10	
BMCCS	66	26	
UMCCS	4	1	
D9	<u>99</u>	<u>41</u>	
	267	99	267 - 99 = 168

From Table III in Ref. 3 we can count the number of ZAIDs scheduled for removal:

Source	Number of ZAIDs
ENDL73	95
ENDL75	10
ENDL76	16
LAMDF	25
ENDF/B-III	<u>20</u>
	166

166 from the above files plus 2 (ZAIDs=6012.04C and 26000.03C) = 168. There is consistency in these numbers.

There were no references to MGXSNP cross sections on XSLIST; 95 entries have been added corresponding to the 95 entries in Table I of the MCNP3B Newsletter (Ref. 2). They are companions, of course, to pointwise cross sections that already existed on XSLIST. I took the lengths for MGXSNP2 entries on XSLIST to be the lengths given on the XSDIR2 directory. Lengths for other ZAIDs on XSLIST correspond to END on Type 3 cross-section files, where END is the 20th word of the TRACE array. There is an unavoidable inconsistency here because there are no Type 3 versions of MGXSNP cross sections.

Besides the 95 ZAIDs for MGXSNP cross sections, I have added to XSLIST the 59 lines shown in Table I of this memo. You can find every line in my Table I in the XSLIST of Appendix A; these are merely copies thereof. These lines correspond to the cross sections which I propose to advertise but for which there would be directory entries only on the special directory XSDIRXAL. The numbers in parentheses following a file name refer to the Special Notes given at the end of XSLIST.

It is intentional that the KIDMAN cross sections have no special note. That's because we can be very confident of those cross sections. They were processed from clearly identifiable ENDF/B-V sources at T = 300°K; they have charged-particle-production cross sections and heating numbers, and there were angular distributions specified for elastic scattering for most evaluations. Thorough checking of the files was carried out as described in Refs. 4 and 5. Even though they have no photon-production data, these are "solid" cross-section sets. It is intentional that I used only 25 ZAIDs from KIDMAN. The missing ZAID (=54135.50C) is a duplicate of that on EPRIXS.

It is also intentional that the U600K cross sections have no special note. These are "solid" cross sections, although I admit to being unable to find a reference for them anywhere. That was evident back in October, 1988 when I checked those new cross-section directories which you had prepared (Ref. 6).

That leaves us the "soft" cross sections to document. We have to tell our users more explicitly where those cross sections came from and why we have reservations about them. That I have tried to do in the notes. The memos are more authoritative, of course, and we should provide them if so requested by a user. But look, please. I am in real trouble with Special Notes 10, 11, and 12. I have no references at all for the notes. I need help in tracing down these three missing references; my filing system has failed me for these three memos. I confess that I have no idea where or what they are. Furthermore, I am missing MAT numbers for 69169.55C and 77000.55C.

In an attempt to be certain that no available cross-section sets were overlooked, I have looked at the names of all the files listed in your CFS directories /X6XS/CTSS, /X6XS/CTSS/1, /X6XS/CTSS/2, and /X6XS/CTSS/3. I deliberately omitted the cross sections on 20KEVXS3 and the low-energy photon cross sections you described in Ref. 7.

You should be informed that I have rearranged the microfiche files for the Monte Carlo cross sections which we store in my office. The 166 fiche for the obsolete ZAIDs discussed here are in a metal box labeled "Obsolete Cross Sections."

It is understood in all this that lack of photon production does not make a cross-section set "soft" in my opinion. It is also understood that I do not consider ZAIDs = 64152.52C and 96245.35C to be "soft" either.

### CHECKING THE CHANGES ON XSLIST

It would please me very much if you were to check every line of Appendix A; that is not a practical request. Instead, I shall tell you what other changes I have made therein; that may help relieve your anxiety over these promiscuous modifications.

In the notes at the end of the Appendix A under source, all references to ENDL73, ENDL75, ENDL76, LAMDF, ENDF/B-III, WEBSTER, and DNA were deleted. I added "mult" to the section under type. It is NOT possible to delete reference to "h" type of photon production, because the high-temperature ENDF/B-IV cross sections on XMCCS are still given this way (ZAIDs 92235.04C – 92235.09C, 92238.04C – 92238.06C, 94239.02C – 94239.07C).

I have removed the arrows from the entries when there has been only one ZA combination in our list. That is because I did not want to get into the controversy of explaining why so many other of the single ZA combination cross sections (the "soft" cross sections) do not have arrows. The ZAIDs from which I removed the arrows are listed in Table II. This may have been a bad thing to do. I am willing to replace them if you or other members of the Team feel strongly about it.

I have changed the arrows for nine ZA combinations listed in Table III for the reasons noted in the table – principally because of the availability of photon-production data. For the krypton isotopes it is acknowledged that MacFarlane had made rough estimates so that heating could better be calculated. These krypton isotopes are among the "soft" cross sections, as are also ZAIDs 64152.52C and 96245.52C. But the Gd-152 and Cm-245 sets are really improvements – "soft" only in the sense that they appear on files mentioned only on XSDIRXAL.

I have put an arrow on ZAID = 55133.50C, because the source is more easily defined. I have no strong feelings on this matter.

## OTHER TASKS IN MANUAL REVISION

The next job insofar as the Manual revision is concerned is to incorporate the description of the multigroup cross-section format (Ref. 8) into Tables F.1 and F.2 of Appendix F and to add new tables corresponding to Ref. 8. This work has not been started, but Judi B. has already looked into the possibility of another column in Tables F.1 and F.2. Helen Byers and Ann Nagy have located the text of Ref. 8. It is useless to us because that memo was prepared using the COMPUCORP system. Helen wants to retype it under TeX on the Sun; then it will be transferable to Judi. I am letting Helen go ahead with the retyping project. The text is NOT available to us in any useful computer form at this time – one more price of “progress.” I’m reminded of John Richter’s “Better is the enemy of good.”

## CROSS-SECTION DIRECTORIES

Finally, let's talk about revised cross-section directories. At the time the multigroup cross sections were made public, you had to make massive changes to all the cross-section directories. I checked that work, and in the course thereof a table summarizing all files referenced by the various directories was prepared (Ref. 6). A new table has been prepared for my proposed replacements for your current directory files. Specifically, under the CFS node /076997/MYRED-STUFF I have five files which are proposed as replacements for yours as follows:

- XSDIR would replace Public XSDIR and /X6XS/CTSS/XSDIR
- XSDIR1 would replace /X6XS/CTSS/1/XSDIR1
- XSDIR2 would replace /X6XS/CTSS/2/XSDIR2
- XSDIR3 would replace /X6XS/CTSS/3/XSDIR3
- XSDIRXAL would replace /X6XS/CTSS/XSDIRXAL.

These five files under /076997/MYREDSTUFF are summarized in Table IV. Note the last column. Entries below MGXSNP2 – there are 61 ( $1502 - 1441 = 61$ ) below MGXSNP2 on the XSDIRXAL list – are the “soft” cross sections, those which are advertised in XSLIST but inaccessible unless the special directory XSDIRXAL is used with MCNP. There are only 59 ZAIDs listed in Table I, but 61 “soft” sets. That's because the cross sections on /X6XS/CTSS/2/AMCM2 are photon interaction sets. The cat chases his tail; everything is consistent.

## ADVERTISING DOSIMETRY CROSS SECTIONS

One other thought – people don't know enough about the wealth of information in the dosimetry libraries. It is impossible to publish the 34 pages of Ref. 9 in the Manual, but I believe we should once again advertise its existence. Unless you object, Judi and I will do that. Must say I was noticing the extensive distribution list on pages 35 – 38 of Ref. 9; wonder what the bxxxxxxs did with their copies??

Now under CFS node  
/REDSTUFF  
19/3/93 Jeff

## SUMMARY

Work is in progress on incorporating the latest cross-section information into the Manual for Version 4 of MCNP. A new version of XSLIST has been proposed to replace Table G.2 of the current Manual, along with corresponding revisions of the cross-section directories. Other work areas are discussed, although there is no concrete progress to report on them at this time.

## REFERENCES

1. J. F. Briesmeister, editor, "MCNP - A General Monte Carlo Code for Neutron and Photon Transport Version 3A," Los Alamos National Laboratory manual LA-7396-M, Rev. 2 (September 1986).
2. J. F. Briesmeister, "MCNP3B Newsletter," Los Alamos National Laboratory internal memorandum X-6:JFB-88-292 to MCNP Distribution (July 18, 1988).
3. R. C. Little, "MCNP Cross-Section Newsletter," Los Alamos National Laboratory internal memorandum X-6:RCL-86-286 to MCNP Distribution (July 11, 1986).
4. R. E. Seamon, "Fission-Product-Isotope Cross Sections in ACE Format," Los Alamos National Laboratory internal memorandum X-6:RES-89-339 to R. B. Kidman (September 13, 1989).
5. R. E. Seamon, "Producing the Fission-Product-File KIDMAN," Los Alamos National Laboratory internal memorandum X-6:RES-89-340 to R. C. Little (September 15, 1989).
6. R. E. Seamon, "New Versions of the Monte Carlo Cross-Section Directories," Los Alamos National Laboratory internal memorandum X-6:RES-88-417 to R. C. Little (October 11, 1988).
7. R. C. Little, "Low-Energy Photon Cross Sections (10 eV - 1 keV) for MCNP," Los Alamos National Laboratory internal memorandum X-6:RCL-85-428 to D. G. Collins (August 26, 1985).
8. R. C. Little, "Multigroup Cross-Section Tables for MCNP3B (Revised)," Los Alamos National Laboratory internal memorandum X-6:RCL-87-161 to Distribution (March 11, 1987).
9. R. C. Little and R. E. Seamon, "Dosimetry/Activation Cross Sections for MCNP," Los Alamos National Laboratory internal memorandum to MCNP Distribution (March 13, 1984).

## DISTRIBUTION

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X-6 Files, MS B226 (2) (w/o Appendix A)

Table I

"Soft" Cross Sections Advertised on XSLIST"

1.32c neutxs(1)	enendl-80	cont	0	no	738		
1.32d neutxs(1)	enendl-80	disc	0	no	1603		
11023.40c e4xs(2)	endf/b-iv	1156	cont	300	yes p(e)	35211	
12000.40c e4xs(2)	endf/b-iv	1280	cont	300	yes p(e)	29763	
14000.40c e4xs(2)	endf/b-iv	1194	cont	300	yes p(e)	76132	
18000.59c arkrc(3)	gp. t-2	1800	cont	300	yes p(e)	3514	
21045.55c sc45(4)	group t-2	2145	cont	300	no	6111	
26000.54c fe54(5)	endf/b-v	1326m4	cont	300	yes p(e)	155635	
35079.55c t2ddc(6)	group t-2	9113	cont	300	no	10472	
35081.55c t2ddc(6)	group t-2	9117	cont	300	no	5383	
---> 36082.59c arkrc(3)	group t-2	1332	cont	300	yes p	7051	
---> 36083.59c arkrc(3)	group t-2	1333	cont	300	yes p	8110	
---> 36084.59c arkrc(3)	group t-2	1334	cont	300	yes p	10411	
---> 36086.59c arkrc(3)	group t-2	1336	cont	300	yes p	8781	
37085.55c t2ddc(6)	group t-2	9160	cont	300	no	27345	
37087.55c t2ddc(6)	group t-2	9163	cont	300	no	8450	
40093.50c kidman	endf/b-v	9232	cont	300	no	2620	
42095.50c kidman	endf/b-v	9282	cont	300	no	15452	
43099.50c kidman	endf/b-v	1308	cont	300	no	12193	
44101.50c kidman	endf/b-v	9330	cont	300	no	5340	
44103.50c kidman	endf/b-v	9332	cont	300	no	3093	
45105.50c kidman	endf/b-v	9355	cont	300	no	1632	
46105.50c kidman	endf/b-v	9382	cont	300	no	4688	
46108.50c kidman	endf/b-v	9386	cont	300	no	4590	
53127.55c t2ddc(6)	group t-2	9606	cont	300	no	59766	
53135.50c kidman	endf/b-v	9618	cont	300	no	1273	
54131.50c kidman	endf/b-v	1351	cont	300	no	22613	
---> 55133.50c kidman	endf/b-v	1355	cont	300	no	26754	
55133.55c t2ddc(6)	group t-2	1355	cont	300	no	67934	
55135.50c kidman	endf/b-v	9665	cont	300	no	1944	
59141.50c kidman	endf/b-v	9742	cont	300	no	15661	
60143.50c kidman	endf/b-v	9764	cont	300	no	17257	
60145.50c kidman	endf/b-v	9766	cont	300	no	38514	
60147.50c kidman	endf/b-v	9768	cont	300	no	1857	
60148.50c kidman	endf/b-v	9769	cont	300	no	10908	
61147.50c kidman	endf/b-v	9783	cont	300	no	9193	
61148.50c kidman	endf/b-v	9784	cont	300	no	1684	
61149.50c kidman	endf/b-v	9786	cont	300	no	2110	
62147.50c kidman	endf/b-v	9806	cont	300	no	33814	
62150.50c kidman	endf/b-v	9809	cont	300	no	9386	
62151.50c kidman	endf/b-v	9810	cont	300	no	7344	
62152.50c kidman	endf/b-v	9811	cont	300	no	41293	
63155.50c kidman	endf/b-v	9832	cont	300	no	4573	
---> 64152.52c gd2hed1(8)	hed1	1362	cont	300	no	15879	
64152.53c gd2hed1(8)	hed1	1362	cont	800	no	15237	
64152.55c gdt2gp(9)	gp. t-2	1362	cont	300	yes p(e)	32651	
64154.55c gdt2gp(9)	gp. t-2	1364	cont	300	yes p(e)	59875	
64155.55c gdt2gp(9)	gp. t-2	1365	cont	300	yes p(e)	54407	
64156.55c gdt2gp(9)	gp. t-2	1366	cont	300	yes p(e)	44452	
64157.55c gdt2gp(9)	gp. t-2	1367	cont	300	yes p(e)	47332	
64158.55c gdt2gp(9)	gp. t-2	1368	cont	300	yes p(e)	113977	
64160.55c gdt2gp(9)	gp. t-2	1370	cont	300	yes p(e)	65322	
69169.55c tm169(10)	gp. t-2	7777	cont	300	no	47982	
77000.55c irnat(11)	gp. t-2	7777	cont	300	no	43112	
91231.50c pa231(12)	endf/b-v	8131	cont	300	no	7066	total
92235.52c u600k	endf/b-v	1395	cont	600	yes p(e)	65347	both
92238.52c u600k	endf/b-v	1398	cont	600	yes p(e)	123260	both
96245.50c cm245(13)	endf/b-v	1345	cont	300	yes p(e)	11664	total
---> 96245.52c cm245(13)	ndfb-v.2	1345	cont	300	yes p(e)	21314	both

Table II

ZAIDs From Which Arrows Were Removed on XSLIST

4007.35C	90233.35C	96248.35C
6013.35C	93235.35C	97249.35C
28058.35C	93238.35C	98249.35C
33074.35C	94237.35C	98250.35C
39088.35C	96243.35C	98251.35C
54134.35C	96246.35C	98252.35C
90231.35C	96247.35C	

Table III

Repositioned Arrows on XSLIST

From 36082.50C to 36082.59C because it has photon production  
From 36083.50C to 36083.59C because it has photon production  
From 36084.50C to 36084.59C because it has photon production  
From 36086.50C to 36086.59C because it has photon production  
From 39089.50C to 39089.35C because it has photon production  
From 64152.50C to 64152.52C because of Note 8  
From 75185.50C to 75185.35C because it has photon production  
From 75187.50C to 75187.35C because it has photon production  
From 96245.35C to 96245.52C because of Note 13

Table IV

Details Concerning New Cross-Section Directories

XSDIR 1873 lines	XSDIR1 1754 lines	XSDIR2 2041 lines	XSDIR3 1589 lines	XSDIRXAL 1936 lines
/x6xs/ctss/3/newxs3	6 /x6xs/ctss/1/newxs1	6 /x6xs/ctss/3/newxs3	6 /x6xs/ctss/3/newxs3	6 /x6xs/ctss/3/newxs3
/x6xs/ctss/3/newxsd3	6 /x6xs/ctss/1/newxsd1	6 /x6xs/ctss/3/newxsd3	6 /x6xs/ctss/3/newxsd3	6 /x6xs/ctss/3/newxsd3
rmccs	64 /x6xs/ctss/1/rmccs1	64 /x6xs/ctss/2/rmccs2	64 rmccs	64 rmccs
rmccsa	27 /x6xs/ctss/1/rmccsa1	27 /x6xs/ctss/2/rmccsa2	27 rmccsa	27 rmccsa
drmccs	91 /x6xs/ctss/1/drmccs1	91 /x6xs/ctss/2/drmccs2	91 drmccs	91 drmccs
/x6xs/ctss/3/endf5ht3	12 /x6xs/ctss/3/endf5ht3	12 /x6xs/ctss/3/endf5ht3	12 /x6xs/ctss/3/endf5ht3	12 /x6xs/ctss/3/endf5ht3
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/x6xs/ctss/2/lldos2	374 /x6xs/ctss/1/lldos1	374 /x6xs/ctss/2/lldos2	374 /x6xs/ctss/2/lldos2	374 /x6xs/ctss/2/lldos2
/x6xs/ctss/2/therxs2	6 /x6xs/ctss/1/therxs1	6 /x6xs/ctss/2/therxs2	6 /x6xs/ctss/2/therxs2	6 /x6xs/ctss/2/therxs2
/x6xs/ctss/2/eprix2	12 /x6xs/ctss/1/eprix1	12 /x6xs/ctss/2/eprix2	12 /x6xs/ctss/2/eprix2	12 /x6xs/ctss/2/eprix2
/x6mgxs/ctss/2/mgxsap2	150 /x6mgxs/ctss/1/mgxsap1	150 /x6mgxs/ctss/2/mgxsap2	150 /x6mgxs/ctss/2/mgxsap2	150 /x6mgxs/ctss/2/mgxsap2
	1441	1441	1441	1441
"+" continue cards	431	"+" continue cards	599	"+" continue cards
header card	1	header card	1	header card
1873	1754	2041	1589	1502

Started from Public XSDIR  
which is same as  
/X6XS/CTSS/XSDIR

Started from  
/X6XS/CTSS/1/XSDIR1

Started from  
/X6XS/CTSS/2/XSDIR2

Started from  
/X6XS/CTSS/3/XSDIR3

XSDIRXAL was started  
from /X6XS/CTSS/XSDIRXAL

/x6xs/ctss/3/u600k3  
/x6xs/ctss/2/fe542  
/x6xs/ctss/3/gd2hedi3

/x6xs/ctss/3/gd12gp3  
/076007/myredstuff/kidman25

/x6xs/ctss/3/tm1693  
/x6xs/ctss/3/irnat3

/x6xs/ctss/3/pa2313  
/x6xs/ctss/3/cm2453

1502  
"+" continue cards 433  
header card 1

360  
1861

(This table is based on Table I of X-6:RES-88-417 (October 11, 1988).)  
(Remember to use tex.old, preview.old, and dump.old in preparing this table.)

790

X-6:RES-90-294

17-MAY-1990

(SECURE)

777  
per T-127

X6

X-6:RES-89-3627  
Oct 3, 1989 / 1076997/MYREDSTUFF/XSLIST

See changes for 6916997/C and 77020D.55 C

USER NUMBER	076997
WORKER MACHINE	6
SUBMIT TIME	90May16 15:26:48
START TIME	90May16 15:52:29
XEROX UNIT	2
Job	62448 (pages 1)

(SECURE)

05/09/90

table 1									
z	2	3	4	5	6	7	8	9	10
zaid	file	source	mat	type	temp( k)	gpd	length	nubar	*****
z = 0 ***** neutron *****									
** neutron **	1.32c	neutxs(1)	endl-80	cont	0	no	738		
	1.32d	neutxsd(1)	endl-80	disc	0	no	1603		
z = 1 ***** hydrogen *****									
** h-1 **	1001.04c	bmcgs	endf/b-1v	1269	cont	0	yes p	2459	
17	1001.04d	d9	endf/b-1v	1269	disc	0	yes p	2914	
18	1001.31c	endl179	endl-79	cont	0	no	2496		
19	1001.31d	dr179	endl-79	disc	0	no	2082		
20	1001.31d	dr179	endl-85	2	cont	0	yes p(e)	3567	
21	1001.35c	endl185	endl/b-v	1301	cont	300	yes p(e)	2827	
22	1001.50c	rmcgs	endf/b-v	1301	disc	300	yes p(e)	3236	
23	1001.50d	drmcgs	endf/b-v	1301	mult	300	yes p(e)	3249	
24	1001.50m	mgxsnp	endf/b-v	1301	cont	300	yes p(e)	2827	
25	1001.51c	endlf5t	endl/b-v	1301	cont	300	yes p(e)	4001	
26	1001.53c	eprixs	endl/b-v	1301	cont	600	yes p(e)		
27	** h-2 **								
28	1002.04c	amccs	endf/b-1v	1120	cont	0	yes p	2144	
29	1002.31c	endl179	endl-79	cont	0	no	1926		
30	1002.31d	dr179	endl-79	disc	0	no	2630		
31	1002.35c	endl185	endl-85	3	cont	0	yes p(e)	2568	
32	1002.50c	endlf5p	endl/b-v	1302	cont	300	yes p(e)	4048	
33	1002.50d	dr5	endl/b-v	1302	disc	300	yes p(e)	4747	
34	1002.51c	endlf5t	endl/b-v	1302	cont	300	yes p(e)	3978	
35	1002.55c	rmcgs	group t-2	120	cont	300	yes p(e)	6042	
36	1002.55d	drmcgs	group t-2	120	disc	300	yes p(e)	5404	
37	1002.55m	mgxsnp	group t-2	120	mult	300	yes p(e)		
38	** n-3 **								
39	1003.03c	bmcgs	endf/b-1v	1169	cont	300	no	2114	
40	1003.03d	d9	endf/b-1v	1169	disc	300	no	2702	
41	1003.31c	endl179	endl-79	cont	300	no	1361		
42	1003.31d	dr179	endl-79	disc	0	no	2259		
43	1003.35c	endl185	endl-85	4	cont	0	no	1310	
44	1003.50c	rmccs	endf/b-v	1169	cont	300	no	2469	
45	1003.50d	drmcgs	endf/b-v	1169	disc	300	no	2848	
46	1003.50m	mgxsnp	endf/b-v	1169	mult	300	no	1927	
47	1003.51c	endlf5t	endf/b-v	1169	cont	300	no	2434	
48									
49	z = 2 ***** helium *****								
50	** he-3 **								
51	** he-3 **								
52	2003.31c	endl179	endl-79	cont	0	no	1743		
53	2003.31d	dr179	endl-79	disc	0	no	2313		
54	2003.35c	endl185	endl-85	5	cont	0	yes p(e)	2542	
55	2003.50c	rmccs	endf/b-v	1146	cont	300	no	2361	
56	2003.50d	drmcgs	endf/b-v	1146	disc	300	no	2653	
57	2003.50m	mgxsnp	endf/b-v	1146	mult	300	no	1843	
58	2003.51c	endlf5t	endl/b-v	1146	cont	300	no	2361	
59	** he-4 **								
60	2004.03c	bmcgs	endf/b-1v	1270	cont	300	no	2407	
61	2004.03d	d9	endf/b-1v	1270	disc	300	no	2202	
62	2004.31c	endl179	endl-79	cont	0	no	1548		
63	2004.31m	dr179	endl-79	disc	0	no	2408		

65    2004.35c end185    end1-85    6    cont    0    no    1483  
 66    ----> 2004.50c rmccs    endf/b-v    1270    cont    300    no    3102  
 67    ----> 2004.50d rmccs    endf/b-v    1270    disc    300    no    2692  
 68    2004.50m mgxsnp    endf/b-v    1270    mult    300    no    1629  
 69    2004.51c endf5t    endf/b-v    1270    cont    300    no    2682  
 70  
 71    z = 3    \*\*\*\* \* lithium \*\*\*\*\*  
 72  
 73  
 74    \*\* 11-6 \*\*  
 75    3006.04c xmccs    endf/b-v    1271    cont    0    yes p    4615  
 76    3006.10c bmccs    las1-sub    101    cont    0    yes p    8294  
 77    3006.10d d9    las1-sub    101    disc    0    yes p    6742  
 78    3006.31c end179    end1-79    cont    0    no    5928  
 79    3006.31d dr179    end1-79    disc    0    no    5012  
 80    ----> 3006.50c rmccs    endf/b-v    1303    cont    300    yes p(e)    9993  
 81    3006.50d drmccs    endf/b-v    1303    disc    300    yes p(e)    8777  
 82    3006.50m mgxsnp    endf/b-v    1303    mult    300    yes p(e)    3566  
 83    3006.51c endf5t    endf/b-v    1303    cont    300    yes p(e)    9196  
 84    \*\* 11-7 \*\*  
 85    3007.05c bmccs    endf/b-v    1272    cont    0    yes p    3751  
 86    3007.05d d9    endf/b-v    1272    disc    0    yes p    3801  
 87    3007.31c end179    end1-79    cont    0    no    2721  
 88    3007.31d dr179    end1-79    disc    0    no    3215  
 89    3007.50c endf5p    endf/b-v    1272    cont    300    yes p(e)    4925  
 90    3007.50d dr5    endf/b-v    1272    disc    300    yes p(e)    4996  
 91    3007.51c endf5t    endf/b-v    1272    cont    300    yes p(e)    4925  
 92    ----> 3007.55c rmccs    group t-2    3007    cont    300    yes p(e)    13232  
 93    3007.55d drmccs    group t-2    3007    disc    300    yes p(e)    12708  
 94    3007.55m mgxsnp    group t-2    3007    mult    300    yes p(e)    3555  
 95  
 96    z = 4    \*\*\*\* beryllium \*\*\*\*\*  
 97  
 98    \*\* be-7 \*\*  
 99    4007.35c end185    end1-85    9    cont    0    no    1875  
 100    4007.35m mgxsnp    end1-85    9    mult    .0    no    1598  
 101    \*\* be-9 \*\*  
 102    4009.03c bmccs    las1-sub    104    cont    300    yes p    7885  
 103    4009.03d d9    las1-sub    104    disc    300    yes p    6622  
 104    4009.03d end179    end1-79    cont    0    no    7737  
 105    4009.31c dr179    end1-79    disc    0    no    7329  
 106    4009.31d dr179    endf/b-v    1304    cont    300    yes p(e)    8947  
 107    ----> 4009.50c rmccs    endf/b-v    1304    disc    300    yes p(e)    8817  
 108    4009.50d drmccs    endf/b-v    1304    mult    300    yes p(e)    3014  
 109    4009.50m mgxsnp    endf/b-v    1304    cont    300    yes p(e)    8073  
 110  
 111  
 112    z = 5    \*\*\*\* baron \*\*\*\*\*  
 113  
 114    \*\* b-10 \*\*  
 115    5010.03c bmccs    endf/b-v    1273    cont    0    yes p    9241  
 116    5010.03d d9    endf/b-v    1273    disc    0    yes p    5720  
 117    5010.31c end179    end1-79    cont    0    no    5180  
 118    5010.31d dr179    end1-79    disc    0    no    3902  
 119    5010.35c end185    end1-85    11    cont    0    yes p(e)    7204  
 120    ----> 5010.50c rmccs    endf/b-v    1305    cont    300    yes p(e)    20261  
 121    5010.50d drmccs    endf/b-v    1305    disc    300    yes p(e)    12383  
 122    5010.50m mgxsnp    endf/b-v    1305    mult    300    yes p(e)    35557  
 123    5010.51c endf5t    endf/b-v    1305    cont    300    yes p(e)    18886  
 124    5010.53c sprixs    endf/b-v    1305    cont    600    yes p(e)    23676  
 125  
 126    \*\* b-11 \*\*  
 127    5011.31c end179    end1-79    cont    0    no    3024  
 128    5011.31d dr179    end1-79    disc    0    no    3946

129      5011.35c endl185  
 130      5011.50c endf5p  
 131      5011.50d dre5  
 132      5011.51c endf5t  
 133      5011.55c rmccsa  
 134      5011.55d drmccs  
 135      ---> 5011.56c newxs  
 136      5011.56d newxsd  
 137      5011.56n mgxsnp  
 138  
 139      z = 6 \*\*\*\*\* carbon \*\*\*\*\*  
 140  
 141      \*\* c-nat \*\*  
 142      ---> 6000.50c rmccs  
 143      6000.50d drmccs  
 144      6000.50m mgxsnp  
 145      6000.51c endf5t  
 146      \*\* c-12 \*\*  
 147      6012.03c xmcccs  
 148      6012.10c bmccs  
 149      6012.10d d9  
 150      6012.31c endl179  
 151      6012.31d dr179  
 152      6012.35c endl185  
 153      ---> 6012.50c rmccs  
 154      6012.50d drmccs  
 155      6012.50n mgxsnp  
 156      \*\* c-13 \*\*  
 157      6013.35c endl185  
 158  
 159  
 160  
 161      z = 7 \*\*\*\*\* nitrogen \*\*\*\*\*  
 162  
 163      \*\* n-14 \*\*  
 164      7014.04c bmccs  
 165      7014.04d d9  
 166      ---> 7014.50c rmccs  
 167      7014.50d drmccs  
 168      7014.50n mgxsnp  
 169      7014.51c endf5t  
 170      \*\* n-15 \*\*  
 171      ---> 7015.55c rmccsa  
 172      7015.55d drmccs  
 173      7015.55n mgxsnp  
 174  
 175  
 176      z = 8 \*\*\*\*\* oxygen \*\*\*\*\*  
 177  
 178      \*\* o-16 \*\*  
 179      8016.04c bmccs  
 180      8016.04d d9  
 181      8016.35c endl185  
 182      ---> 8016.50c rmccs  
 183      8016.50d drmccs  
 184      8016.50n mgxsnp  
 185      8016.51c endf5t  
 186      8016.53c eprixs  
 187      8016.54c eprixs  
 188  
 189  
 190      z = 9 \*\*\*\*\* fluorine \*\*\*\*\*  
 191  
 192      \*\* f-19 \*\*

193        9019.02c        xmccs        endf/b-1v        1277        cont        0        yes h        26334  
 194        9019.03c        bmccs        endf/b-1v        1277        cont        0        yes p        24464  
 195        9019.03d        d9        endf/b-1v        1277        disc        0        yes p        8926  
 196        9019.31c        end179        end1-79        cont        0        no        23368  
 197        9019.31d        dr179        end1-79        disc        0        no        9764  
 198        9019.35c        end185        end1-85        17        cont        0        yes p(e)        31608  
 199        --> 9019.50c        endf5p        endf/b-v        1309        cont        300        yes p(e)        44191  
 200        --> 9019.50d        dr5        endf/b-v        1309        disc        300        yes p(e)        23217  
 201        9019.50m        mgxsnp        endf/b-v        1309        mult        300        yes p(e)        3261  
 202        9019.51c        rmccs        endf/b-v        1309        cont        300        yes p(e)        41503  
 203        9019.51d        drmccs        endf/b-v        1309        disc        300        yes p(e)        23217  
 204  
 205        z = 11        \*\*\*\*\* sodium \*\*\*\*\*  
 206  
 207        \*\* na-23 \*\*        11023.31c        end179        end1-79        cont        0        no        14656  
 208        11023.31d        dr179        end1-79        disc        0        no        4299  
 210        11023.35c        end185        end1-85        18        cont        0        yes p(e)        22838  
 211        11023.40c        e4xs(2)        endf/b-1v        1156        cont        300        yes p(e)        35211  
 212        11023.40c        e4xs(2)        endf/b-1v        1156        cont        300        yes p(e)        52313  
 213        --> 11023.50c        endf5p        endf/b-v        1311        disc        300        yes p(e)        41726  
 214        11023.50d        dr5        endf/b-v        1311        disc        300        yes p(e)        2982  
 215        11023.50m        mgxsnp        endf/b-v        1311        mult        300        yes p(e)        48924  
 216        11023.51c        rmccs        endf/b-v        1311        cont        300        yes p(e)        41726  
 217        11023.51d        drmccs        endf/b-v        1311        disc        300        yes p(e)        41726  
 218  
 219        z = 12        \*\*\*\*\* magnesium \*\*\*\*\*  
 220  
 221        \*\* mg-hat \*\*        12000.31c        end179        end1-79        cont        0        no        6199  
 222        12000.31d        dr179        end1-79        disc        0        no        3626  
 223        12000.35c        end185        end1-85        19        cont        0        yes p(e)        9747  
 224        12000.40c        e4xs(2)        endf/b-1v        1280        cont        300        yes p(e)        29763  
 225        12000.40c        e4xs(2)        endf/b-1v        1280        cont        300        yes p(e)        56395  
 226        --> 12000.50c        endf5u        endf/b-v        1312        disc        300        yes p(e)        14131  
 227        12000.50d        dr5        endf/b-v        1312        disc        300        yes p(e)        3802  
 228        12000.50m        mgxsnp        endf/b-v        1312        mult        300        yes p(e)        48978  
 229        12000.51c        rmccs        endf/b-v        1312        cont        300        yes p(e)        14131  
 230        12000.51d        drmccs        endf/b-v        1312        disc        300        yes p(e)        53438  
 231  
 232  
 233        z = 13        \*\*\*\*\* aluminum \*\*\*\*\*  
 234  
 235        \*\* al-27 \*\*        13027.04c        bmccs        endf/b-1v        1193        cont        0        yes p        32517  
 236        13027.04d        d9        endf/b-1v        1193        disc        0        yes p        9700  
 237        13027.31c        end179        end1-79        cont        0        no        27295  
 238        13027.31d        dr179        end1-79        disc        0        no        9871  
 239        13027.35c        end185        end1-85        20        cont        0        yes p(e)        36956  
 240        13027.35c        end185        endf/b-v        1313        cont        300        yes p(e)        54223  
 241        --> 13027.50c        rmccs        endf/b-v        1313        disc        300        yes p(e)        42008  
 242        13027.50d        dr5        endf/b-v        1313        mult        300        yes p(e)        3853  
 243        13027.50m        mgxsnp        endf/b-v        1313        cont        300        yes p(e)        53438  
 244        13027.51c        endf5t        endf/b-v        1313        disc        300        yes p(e)        69559  
 245  
 246  
 247        z = 14        \*\*\*\*\* silicon \*\*\*\*\*  
 248  
 249        \*\* si-hat \*\*        14000.31c        end179        end1-79        cont        0        no        11924  
 250        14000.31d        dr179        end1-79        disc        0        no        3955  
 251        14000.35c        end185        end1-85        21        cont        0        yes p(e)        19077  
 252        14000.40c        e4xs(2)        endf/b-1v        1194        cont        300        yes p(e)        76132  
 253        14000.40c        e4xs(2)        endf/b-v        1314        cont        300        yes p(e)        98670  
 254        14000.50c        endf5p        endf/b-v        1314        disc        300        yes p(e)        69559  
 255        14000.50d        dr5        endf/b-v        1314        disc        300        yes p(e)        69559

257 14000.50m mgxsnp endf/b-v 1314 mult 300 yes p(e) 3266  
 258 14000.51c rmcccs endf/b-v 1314 cont 300 yes p(e) 88190  
 259 14000.51d drmcccs endf/b-v 1314 disc 300 yes p(e) 69559  
 260  
 261 z = 15 \*\*\*\*\* phosphorus \*\*\*\*\*  
 262 \*\* p-31 \*\* 15031.31c endl179 endl1-79 cont 0 no 3637  
 263 \*\* 15031.31d dr179 endl1-79 disc 0 no 3423  
 264 \*\* 15031.35c endl185 endl1-85 22 cont 0 yes p(e) 5936  
 265 15031.35c endl185 endl1-85 22 cont 0 yes p(e) 5794  
 266 15031.35c endl185 endl1-85 22 cont 300 yes p(e) 5822  
 267 15031.50c endlf5u endlf/b-v 1315 disc 300 yes p(e) 2123  
 268 ---> 15031.50d dres5 endlf/b-v 1315 mult 300 yes p(e) 5793  
 269 15031.50m mgxsnp endlf/b-v 1315 cont 300 yes p(e) 5822  
 270 15031.51c rmcccs endlf/b-v 1315 disc 300 yes p(e) 5793  
 271 15031.51d drmcccs endlf/b-v 1315 disc 300 yes p(e) 5822  
 272  
 273  
 274  
 275 z = 16 \*\*\*\*\* sulfur \*\*\*\*\*  
 276 \*\* s-32 \*\* 16032.31c endl179 endl1-79 cont 0 no 4071  
 277 \*\* 16032.31d dr179 endl1-79 disc 0 no 3341  
 278 16032.35c endlf5u endlf/b-v 1316 cont 0 yes p(e) 7115  
 279 16032.35c endlf5u endlf/b-v 1316 cont 300 yes p(e) 6850  
 280 16032.35c endlf5u endlf/b-v 1316 disc 300 yes p(e) 6363  
 281 ---> 16032.50c endlf5u endlf/b-v 1316 mult 300 yes p(e) 2185  
 282 16032.50d dres5 endlf/b-v 1316 cont 300 yes p(e) 6841  
 283 16032.50m mgxsnp endlf/b-v 1316 disc 300 yes p(e) 6363  
 284 16032.51c rmcccs endlf/b-v 1316 cont 300 yes p(e) 18270  
 285 16032.51d drmcccs endlf/b-v 1316 disc 300 yes p(e)  
 286  
 287  
 288 z = 17 \*\*\*\*\* chlorine \*\*\*\*\*  
 289 \*\* cl-nat \*\* 17000.31c endl179 endl1-79 cont 0 no 8664  
 290 \*\* 17000.31d dr179 endl1-79 disc 0 no 3430  
 291 17000.35c endl185 endl1-85 24 cont 0 yes p(e) 12964  
 292 17000.35c endl185 endl1-85 24 cont 300 yes p(e) 23374  
 293 ---> 17000.50c endlf5p endlf/b-v 1149 disc 300 yes p(e) 18270  
 294 17000.50d dres5 endlf/b-v 1149 mult 300 yes p(e) 2737  
 295 17000.50m mgxsnp endlf/b-v 1149 cont 300 yes p(e) 21145  
 296 17000.51c rmcccs endlf/b-v 1149 disc 300 yes p(e) 18270  
 297 17000.51d drmcccs endlf/b-v 1149 disc 300 yes p(e)  
 298  
 299  
 300  
 301 z = 18 \*\*\*\*\* argon \*\*\*\*\*  
 302 \*\* ar-nat \*\* 18000.31c endl179 endl1-79 cont 0 no 2857  
 303 \*\* 18000.31d dr179 endl1-79 disc 0 no 2939  
 304 18000.35c rmccsa endl1-85 25 cont 0 yes p(e) 5646  
 305 18000.35d drmccsa endl1-85 25 disc 0 yes p(e) 14764  
 306 ---> 18000.35m mgxsnp endl1-85 25 mult 0 yes p(e) 2022  
 307 18000.59c arkrc(3) gp. t-2 1800 cont 300 yes p(e) 3514  
 308 18000.59c arkrc(3) gp. t-2 1800 cont 300 yes p(e)  
 309  
 310  
 311  
 312 z = 19 \*\*\*\*\* potassium \*\*\*\*\*  
 313 \*\* k-nat \*\* 19000.31c endl179 endl1-79 cont 0 no 6645  
 314 \*\* 19000.31d dr179 endl1-79 disc 0 no 3293  
 315 19000.35c endl185 endl1-85 26 cont 0 yes p(e) 11191  
 316 19000.35c endl185 endl1-85 26 cont 300 yes p(e) 22112  
 317 19000.50c endlf5u endlf/b-v 1150 disc 300 yes p(e) 23198  
 318 ---> 19000.50d dres5 endlf/b-v 1150 mult 300 yes p(e) 2833  
 319 19000.50m maxsnp endlf/b-v 1150 mult 300 yes p(e)

```

321      19000.51c rmccs      endf/b-v 1150      cont      300  yes p(e)  18859
322      19000.51d drmccs     endf/b-v 1150      disc      300  yes p(e)  23198
323
324      z = 20 **** * calcium ****
325
326      ** ca-nat **
327      ** 20000. 10c bmccs      endf/b-v 1195      cont      0  yes p  24085
328      ** 20000. 10d d9          endf/b-v 1195      disc      0  yes p  9198
329      ** 20000. 10d d9          end179      cont      0  no   8959
330      ** 20000. 31c end179      end179      disc      0  no   3637
331      ** 20000. 31d dr179      end179      cont      0  yes p(e) 12994
332      ** 20000. 35c end185      end185      cont      0  yes p(e) 62685
333      ---> 20000. 50c endf5u      endf/b-v 1320      cont      300  yes p(e) 29094
334      ---> 20000. 50d dr5          endf/b-v 1320      disc      300  yes p(e) 29094
335      ** 20000. 50m mgxsnp      endf/b-v 1320      mult      300  yes p(e) 3450
336      ** 20000. 51c rmccs      endf/b-v 1320      cont      300  yes p(e) 53433
337      ** 20000. 51d drmccs     endf/b-v 1320      disc      300  yes p(e) 29094
338
339      z = 21 **** * scandium ****
340
341      ** sc-21 **
342      ** 21045.55c sc45(4) group t-2 2145      cont      300  no   6111
343
344
345
346      z = 22 **** * titanium ****
347
348      ** t1-nat **
349      ** 22000. 11c bmccs      endf/b-v 1286      cont      300  yes p  10644
350      ** 22000. 11d d9          endf/b-v 1286      disc      300  yes p  3897
351      ** 22000. 31c end179      end179      cont      0  no   9626
352      ** 22000. 31d dr179      end179      disc      0  no   3205
353      ** 22000. 35c end185      end185      cont      0  yes p(e) 13482
354      ---> 22000. 50c endf5u      endf/b-v 1322      cont      300  yes p(e) 54862
355      ** 22000. 50d dr5          endf/b-v 1322      disc      300  yes p(e) 10514
356      ** 22000. 50m mgxsnp      endf/b-v 1322      mult      300  yes p(e) 3015
357      ** 22000. 51c rmccs      endf/b-v 1322      cont      300  yes p(e) 31893
358      ** 22000. 51d drmccs     endf/b-v 1322      disc      300  yes p(e) 10514
359
360
361      z = 23 **** * vanadium ****
362
363      ** v-nat **
364      ** 23000. 30c bmccs      endf/b-v 1196      cont      0  yes p  6456
365      ** 23000. 30d d9          endf/b-v 1196      disc      0  yes p  4603
366      ---> 23000. 50c endf5u      endf/b-v 1323      cont      300  yes p(e) 38373
367
368
369
370
371      ** v-51 **
372      ** 23051. 31c end179      end179      cont      0  no   21394
373      ** 23051. 31d dr179      end179      disc      0  no   5505
374
375
376      z = 24 **** * chromium ****
377
378      ** cr-nat **
379      ** 24000. 11c bmccs      endf/b-v 1191      cont      300  yes p  38240
380      ** 24000. 11d d9          endf/b-v 1191      disc      300  yes p  11767
381      ** 24000. 12c xmccs      endf/b-v 1191      cont      900  yes p  51663
382      ** 24000. 31c end179      end179      cont      0  no   5827
383      ** 24000. 31d dr179      end179      disc      0  no   5260
384      ** 24000. 35c end185      end185      cont      0  yes  9279

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385 ----> 24000.50c rmccs endf/b-v 1324 cont 300 yes p(e) 134515  
 386 24000.50d drmccs endf/b-v 1324 disc 300 yes p(e) 30775  
 387 24000.50m mgxsnp endf5t endf/b-v 1324 mult 300 yes p(e) 3924  
 388 24000.51c endf5t endf/b-v 1324 cont 300 yes p(e) 55677

390 z = 25 \*\*\*\*\* manganese \*\*\*\*

391 392 393 394 395 396 397 398 399 400 401 402 403 404 405 406 407 408 409 410 411 412 413 414 415 416 417 418 419 420 421 422 423 424 425 426 427 428 429 430 431 432 433 434 435 436 437 438 439 440 441 442 443 444 445 446 447

\*\* Mn-55 \*\* 25055.31c end179 end1-79 cont 0 no 4149  
 25055.31d dr179 end1-79 disc 0 no 3186  
 25055.35c end185 end1-85 31 cont 0 yes p(e) 7554  
 25055.35c endf5t endf/b-v 1325 cont 300 yes p(e) 105154  
 25055.50c endf5t endf/b-v 1325 disc 300 yes p(e) 9742  
 25055.50m mgxamp endf/b-v 1325 mult 300 yes p(e) 2890  
 25055.51c rmccs endf/b-v 1325 cont 300 yes p(e) 25788  
 25055.51d drmccs endf/b-v 1325 disc 300 yes p(e) 9742

z = 26 \*\*\*\*\* iron \*\*\*\*

\*\* fe-nat \*\* 26000.11c bmcas endf/b-v 1192 cont 300 yes p 54104  
 26000.11d d9 endf/b-v 1192 disc 300 yes p 8852  
 26000.12c xmcas endf/b-v 1192 cont 900 yes p 57638  
 26000.31c end179 end1-79 cont 0 no 23950  
 26000.31d dr179 end1-79 disc 0 no 3339  
 26000.35c end185 end1-85 32 cont 0 yes p(e) 31044  
 26000.50c endf5p endf/b-v 1326 cont 300 yes p(e) 115508  
 26000.50d dr5 endf/b-v 1326 disc 300 yes p(e) 33957  
 26000.51c endf5t endf/b-v 1326 cont 300 yes p(e) 78377  
 26000.54c fe54(5) endf/b-v 1326m4 cont 300 yes p(e) 155635  
 26000.55c rmccs group t-2 260 cont 300 yes p(e) 178453  
 26000.55d drmccs group t-2 260 disc 300 yes p(e) 72693  
 26000.55m mgxsnp group t-2 260 mult 300 yes p(e) 4304

z = 27 \*\*\*\*\* cobalt \*\*\*\*

\*\* co-59 \*\* 27059.31c end179 end1-79 cont 0 no 31707  
 27059.31d dr179 end1-79 disc 0 no 6391  
 27059.35c end185 end1-85 33 cont 0 yes p(e) 39019  
 27059.50c endf5t endf/b-v 1327 cont 300 yes p(e) 117136  
 27059.50d dr5 endf/b-v 1327 disc 300 yes p(e) 11830  
 27059.50m mgxsnp endf/b-v 1327 mult 300 yes p(e) 2889  
 27059.51c rmccs endf/b-v 1327 cont 300 yes p(e) 28416  
 27059.51d drmccs endf/b-v 1327 disc 300 yes p(e) 11830

z = 28 \*\*\*\*\* nickel \*\*\*\*

\*\* ni-nat \*\* 28000.11c bmcas endf/b-v 1190 cont 300 yes p 35192  
 28000.11d d9 endf/b-v 1190 disc 300 yes p 5658  
 28000.12c xmcas endf/b-v 1190 cont 900 yes p 40842  
 28000.31c end179 end1-79 cont 0 no 32964  
 28000.31d dr179 end1-79 disc 0 no 8096  
 28000.50c rmccs endf/b-v 1328 cont 300 yes p(e) 139974  
 28000.50d drmccs endf/b-v 1328 disc 300 yes p(e) 22059  
 28000.50m mgxsnp endf/b-v 1328 mult 300 yes p(e) 3373  
 28000.51c endf5t endf/b-v 1328 cont 300 yes p(e) 93636  
 \*\* ni-58 \*\* 28058.35c end185 end1-85 35 cont 0 yes p(e) 42805

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449
450      z = 29 ***** copper *****
451
452      ** cu-nat **
453      ** cu-nat **
454      29000. 10c  bmccs  endl/b-1v 1295  cont   0  yes p  14703
455      29000. 10d  d9    endl/b-1v 1295  disc   0  yes p  8610
456      29000. 31c  endl179  endl-79  disc   0  no   4157
457      29000. 31d  dr179  endl-79  disc   0  no   4066
458      29000. 35c  endl185  endl-85  36   cont   0  yes p(e)  7100
459      --> 29000. 50c  rmccs  endl/b-v 1329  cont   300  yes p(e)  51911
460      --> 29000. 50d  drmccs  endl/b-v 1329  disc   300  yes p(e)  12838
461      29000. 50m  mgxsnp  endl/b-v 1329  mult   300  yes p(e)  2803
462      29000. 51c  endlf5t  endl/b-v 1329  cont   300  yes p(e)  51375
463
464      z = 31 ***** gallium *****
465
466      ** ga-nat **
467      ** ga-nat **
468      31000. 31c  endl179  endl-79  disc   0  no   4225
469      31000. 31d  dr179  endl-79  cont   0  no   3027
470      31000. 35c  endl185  endl-85  37   cont   0  yes p(e)  7570
471      --> 31000. 50c  rmccs  endl/b-v 1358  cont   300  yes p(e)  7989
472      31000. 50d  drmccs  endl/b-v 1358  disc   300  yes p(e)  6272
473      31000. 50m  mgxsnp  endl/b-v 1358  mult   300  yes p(e)  2084
474      31000. 51c  endlf5t  endl/b-v 1358  cont   300  yes p(e)  7989
475
476      z = 33 ***** arsenic *****
477      z = 33 ***** gallium *****
478
479      ** as-74 **
480      ** as-74 35c endl185  endl-85  38   cont   0  yes p(e)  50942
481      ** as-75 **
482      --> 33075. 35c  rmccsa  endl-85  39   cont   0  yes p(e)  50992
483      33075. 35d  drmccs  endl-85  39   disc   0  yes p(e)  8541
484      33075. 35m  mgxsnp  endl-85  39   mult   0  yes p(e)  2022
485
486      z = 35 ***** bromine *****
487      z = 35 ***** bromine *****
488
489      ** br-79 **
490      ** br-79 .55c t2ddc(6) group t-2 9113  cont   300  no   10472
491      ** br-81 **
492      ** br-81 .55c t2ddc(6) group t-2 9117  cont   300  no   5383
493
494
495      z = 36 ***** krypton *****
496
497      ** kr-78 **
498      --> 36078. 50c  rmccsa  endl/b-v 1330  cont   300  no   9098
499      36078. 50d  drmccs  endl/b-v 1330  disc   300  no   4399
500      36078. 50m  mgxsnp  endl/b-v 1330  mult   300  no   2108
501      ** kr-80 **
502      --> 36080. 50c  rmccsa  endl/b-v 1331  cont   300  no   10206
503      36080. 50d  drmccs  endl/b-v 1331  disc   300  no   4317
504      36080. 50m  mgxsnp  endl/b-v 1331  mult   300  no   2257
505      ** kr-82 **
506      36082. 50c  rmccsa  endl/b-v 1332  cont   300  no   7261
507      36082. 50d  drmccs  endl/b-v 1332  disc   300  no   4307
508      36082. 50m  mgxsnp  endl/b-v 1332  mult   300  no   2312
509      --> 36082. 59c  arkrc(3) group t-2 1332  cont   300  yes p   7051
510      ** kr-83 **
511      36083. 50c  rmccsa  endl/b-v 1333  cont   300  no   8119
512      36083. 50d  drmccs  endl/b-v 1333  disc   300  no   4400

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513   ---> 36083.50m mgxsnp arkrc(3) group t-2 1333 endf/b-v 1333 mult 300 no  
 514   \*\* kr-84 \*\* 36084.50c rmccs endf/b-v 1334 cont 300 no  
 515   \*\* kr-84 \*\* 36084.50c rmccs endf/b-v 1334 disc 300 no  
 516   36084.50d rmccs endf/b-v 1334 mult 300 no  
 517   36084.50d rmccs endf/b-v 1334 disc 300 no  
 518   36084.50m mgxsnp arkrc(3) group t-2 1334 cont 300 yes p  
 519   ---> 36084.59c arkrc(3) group t-2 1334 cont 300 yes p  
 520   \*\* kr-86 \*\* 36086.50c rmccs endf/b-v 1336 cont 300 no  
 521   36086.50c rmccs endf/b-v 1336 disc 300 no  
 522   36086.50d rmccs endf/b-v 1336 mult 300 no  
 523   36086.50m mgxsnp arkrc(3) group t-2 1336 cont 300 yes p  
 524   ---> 36086.59c arkrc(3) group t-2 1336 cont 300 yes p  
 525  
 526  
 527 z = 37 \*\*\*\*\* rubidium \*\*\*\*\*  
 528   \*\* rb-85 \*\* 37085.55c t2ddc(6) group t-2 9160 cont 300 no  
 529   \*\* rb-85 \*\* 37085.55c t2ddc(6) group t-2 9163 cont 300 no  
 530   \*\* rb-87 \*\* 37087.55c t2ddc(6) group t-2 9163 cont 300 no  
 531   \*\* rb-87 \*\* 37087.55c t2ddc(6) group t-2 9163 cont 300 no  
 532  
 533  
 534  
 535 z = 39 \*\*\*\*\* yttrium \*\*\*\*\*  
 536   \*\* y-88 \*\* 39088.35c end185 end1-85 40 cont 0 yes p(e) 11360  
 537   \*\* y-89 \*\* 39089.35c miscxr end1-85 41 cont 0 yes p(e) 49946  
 538   \*\* y-89 \*\* 39089.35c miscxr end1-85 41 cont 300 no  
 539   ---> 39089.35c miscxr end1-85 41 cont 300 no  
 540   ---> 39089.50c endf5u(7) endf/b-v 9202 disc 300 no  
 541   39089.50d dres5 endf/b-v 9202 disc 300 no  
 542  
 543  
 544 z = 40 \*\*\*\*\* zirconium \*\*\*\*\*  
 545  
 546   \*\* zr-nat \*\* 40000.31c end179 end1-79 cont 0 no  
 547   40000.31d dr179 end1-79 disc 0 no  
 548   40000.31d dr179 end1-79 disc 0 no  
 549   40000.35c end185 end1-85 42 cont 0 yes p(e) 4749  
 550   40000.35c endf5p endf/b-v 1340 cont 300 no  
 551   ---> 40000.50c endf5p endf/b-v 1340 cont 300 no  
 552   40000.50d dres5 endf/b-v 1340 disc 300 no  
 553   40000.50m mgxsnp endf/b-v 1340 mult 300 no  
 554   40000.51c rmccs endf/b-v 1340 disc 300 no  
 555   40000.51d drmccs endf/b-v 1340 disc 300 no  
 556   40000.53c eprixs endf/b-v 1340 cont 600 no  
 557   \*\* zr-93 \*\* 40093.50c kidman endf/b-v 9232 cont 300 no  
 558  
 559  
 560  
 561 z = 41 \*\*\*\*\* niobium \*\*\*\*\*  
 562   \*\* nb-93 \*\* 41093.31c end179 end1-79 cont 0 no  
 563   \*\* 41093.31c end179 end1-79 disc 0 no  
 564   41093.31d dr179 end1-79 cont 0 yes p(e) 50502  
 565   41093.35c end185 end1-85 43 cont 300 yes p(e) 129021  
 566   41093.35c endf5p endf/b-v 1189 disc 300 yes p(e) 10393  
 567   ---> 41093.50c endf5p endf/b-v 1189 disc 300 yes p(e) 2746  
 568   41093.50d dres5 endf/b-v 1189 mult 300 yes p(e) 14736  
 569   41093.50m mgxsnp endf/b-v 1189 cont 300 yes p(e) 10393  
 570   41093.51c rmccs endf/b-v 1189 disc 300 yes p(e)  
 571   41093.51d drmccs endf/b-v 1189 disc 300 yes p(e)  
 572  
 573  
 574 z = 42 \*\*\*\*\* molybdenum \*\*\*\*\*  
 575   \*\* mo-nat \*\*

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577    42000.31c end179
578    42000.31d dr179
579    42000.35c end185
580    ---> 42000.50c endf5u
581    42000.50d dres5
582    42000.50m mgxsnp
583    42000.51c rmccs
584    42000.51d drmccs
585    ** mo-95 **
586    42095.50c kidman
587
588    z = 43 ***** technetium ****
589    590    ** tc-99 **
591    43099.50c kidman
592
593    594    z = 44 ***** ruthenium ****
595    596    ** ru-101 **
597    598    ** 44101.50c kidman
599    599    ** ru-103 **
600    600    ** 44103.50c kidman
601
602    603    z = 45 ***** rhodium ****
604    605    ** rh-103 **
605    ---> 45103.50c rmccs
606    607    45103.50d drmccs
608    608    ** 45103.50m mgxsnp
609    609    ** rh-105 **
610    610    ** 45105.50c kidman
611
612    613    z = 45 ***** average fission product from uranium-235 ****
614    615    ** U-235 fp **
615    ---> 45117.90c rmccs
616    617    45117.90d drmccs
618    618    ** 45117.90m mgxsnp
619
620    621    z = 46 ***** palladium ****
622
623    623    ** pd-105 **
624    624    ** 46105.50c kidman
625    625    ** pd-108 **
626    626    ** 46108.50c kidman
627
628    629    z = 46 ***** average fission product from plutonium-239 ****
630
631    631    ** pu-239 fp **
632    ---> 46119.90c rmccs
624    624    ** 46119.90d drmccs
633    633    ** 46119.90m mgxsnp
634
635
636
637    637    z = 47 ***** silver ****
638
639
640

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\*-nat \*\*

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641 ---> 47000.55c rmcccs group t-2 47 cont 300 yes p(e) 29153
642 ---> 47000.55d drmccs group t-2 47 disc 300 yes p(e) 12470
643 ---> 47000.55m mgxsnp group t-2 47 mult 300 yes p(e) 2693
644 ** ag-107 ** end185 cont 0 yes p(e) 13195
645 ---> 47107.35c end185 endl/b-v 1371 cont 300 no 12152
646 ---> 47107.50c drmccs endl/b-v 1371 disc 300 no 4124
647 ---> 47107.50d drmccs endl/b-v 1371 mult 300 no 2107
648 ** ag-109 ** end185 cont 0 yes p(e) 13513
649 ---> 47109.35c end185 endl/b-v 1373 cont 300 no 14626
650 ---> 47109.35d rmcccs endl/b-v 1373 disc 300 no 3864
651 ---> 47109.50c rmcccs endl/b-v 1373 mult 300 no 1924
652 ---> 47109.50d drmccs endl/b-v 1373
653 47109.50m mgxsnp
654

655 z = 48 **** cadmium **** cadmium ****
656 ****
657 ** cd-nat **
658 ** 48000.31c endl79 endl79 cont 0 no 8131
659 48000.31d dr179 endl79 disc 0 no 3031
660 48000.31e endl85 endl79 cont 0 yes p(e) 12344
661 48000.35c endlf5u endl/b-v 1281 cont 300 no 19755
662 ---> 48000.50c endlf5u endl/b-v 1281 disc 300 no 3067
663 , 48000.50d dr5 endl/b-v 1281 mult 300 no 1841
664 , 48000.50m mgxsnp endl/b-v 1281 cont 300 no 6775
665 , 48000.51c rmcccs endl/b-v 1281 disc 300 no 3067
666 48000.51d drmccs endl/b-v 1281
667

668 z = 50 **** tin **** tin ****
669
670 ** sn-nat **
671 ** sn-nat **
672 50000.31c endl79 endl79 cont 0 no 2876
673 50000.31d dr179 endl79 disc 0 no 3256
674 ---> 50000.35c endl85 endl85 cont 0 yes p(e) 6031
675

676 z = 50 **** fission products ****
677 ****
678
679 ** ave fp **
680 ---> 50120.35c rmcccs endl85 102 cont 0 yes p(e) 8427
681 50120.35d drmccs endl85 102 disc 0 yes p(e) 9024
682 50120.35m mgxsnp endl85 102 mult 0 yes 1929
683 50998.99m mgxsnp permfile 0 no 1382
684 50999.99m mgxsnp permfile 0 no 1413
685

686 z = 53 **** iodine **** iodine ****
687
688 ** 1-127 ** endl85 cont 300 no 59766
689 ---> 53127.55c t2ddc(6) group t-2 9606
690 ** 1-135 ** endl85 49 cont 300 no 1273
691 53135.50c kidman endl/b-v 9618
692
693
694 z = 54 **** xenon **** xenon ****
695
696
697 ** xe-nat **
698 ---> 54000.35c endl85 endl85 49 cont 0 yes p(e) 41493
699 54000.35m mgxsnp endl85 49 mult 0 yes 1929
700 ** xe-131 ** 54131.50c kidman endl/b-v 1351 cont 300 no 22613
701 ** xe-134 ** 54134.35c endl85 endl85 50 cont 0 yes p(e) 7524
702
703 ** xe-135 **

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769    \*\* sm-152 \*\*    62151.50c kidman    endf/b-v 9810    cont    300    no    7344  
 770    \*\* sm-152 \*\*    62152.50c kidman    endf/b-v 9811    cont    300    no    41293  
 771                    63000.31c end179    end1-79    cont    0    no    3532  
 772                    63000.31d dr179    end1-79    disc    0    no    3039  
 773                    63000.35c rmccsa    end1-85    52    cont    0    yes p(e)    6987  
 774    z = 63    \*\*\*\*\* europium \*\*\*\*\*    cont    0    yes p(e)    6715  
 775                    63000.35d drmccs    end1-85    52    disc    0    yes p(e)    1933  
 776                    63000.35m mgxsnp    end1-85    52    mult    0    yes p(e)    68118  
 777                    63151.50c rmcccs    endf/b-v 1357    cont    300    yes p(e)    10074  
 778                    63151.50d drmccs    endf/b-v 1357    disc    300    yes p(e)    16796  
 779                    63151.51c endf5t    endf/b-v 1357    cont    300    yes p(e)    86636  
 780                    63151.51c endf5t    group t-2    151    cont    300    yes p(e)    35260  
 781                    63151.55c newxs    group t-2    151    disc    300    yes p(e)    2976  
 782                    63151.55d newxsd    group t-2    151    disc    300    yes p(e)    2976  
 783                    63151.55m mgxsnp    group t-2    151    mult    300    yes p(e)    2976  
 784                    63152.50c endf5u    endf/b-v 1292    cont    300    no    49354  
 785                    63152.50d dre5    endf/b-v 1292    disc    300    no    5696  
 786                    63152.51c endf5t    endf/b-v 1292    cont    300    no    10893  
 787                    63152.55c newxs    group t-2    153    cont    300    yes p(e)    55292  
 788                    63152.55d newxsd    group t-2    153    disc    300    yes p(e)    11305  
 789                    63152.55m mgxsnp    group t-2    153    mult    300    yes p(e)    15463  
 790                    63152.56c endf5u    endf/b-v 1293    cont    300    no    37049  
 791                    63152.56d dre5    endf/b-v 1293    disc    300    no    5499  
 792                    63152.56c endf5t    endf/b-v 1293    cont    300    no    10407  
 793                    63153.50c rmcccs    endf/b-v 1359    cont    300    yes p(e)    73032  
 794                    63153.50d drmccs    endf/b-v 1359    disc    300    yes p(e)    36433  
 795                    63153.51c endf5t    endf/b-v 1359    cont    300    yes p(e)    2976  
 796                    63153.55c newxs    group t-2    153    cont    300    yes p(e)    2976  
 797                    63153.55d newxsd    group t-2    153    disc    300    yes p(e)    2976  
 798                    63153.55m mgxsnp    group t-2    153    mult    300    yes p(e)    2976  
 799                    63154.50c endf5u    endf/b-v 1293    cont    300    no    49613  
 800                    63154.50d dre5    endf/b-v 1293    disc    300    no    5971  
 801                    63154.50c endf5t    endf/b-v 1293    cont    300    no    11520  
 802                    63154.51c endf5t    endf/b-v 1293    cont    300    yes p(e)    59875  
 803                    63154.51c endf5t    endf/b-v 1293    cont    300    yes p(e)    59875  
 804                    63155.50c kidman    endf/b-v 9832    cont    300    no    45006  
 805                    63155.50c kidman    endf/b-v 9832    cont    300    no    6569  
 806                    63155.50d dre5    endf/b-v 9832    cont    300    no    11919  
 807                    63155.50c endf5u    endf/b-v 1364    cont    300    no    54407  
 808    z = 64    \*\*\*\*\* gadolinium \*\*\*\*\*    cont    0    no    4192  
 809                    64000.31c end179    end1-79    cont    0    no    3092  
 810                    64000.31d dr179    end1-79    disc    0    no    7939  
 811                    64000.35c rmccsa    end1-85    53    cont    0    yes p(e)    6894  
 812                    64000.35d drmccs    end1-85    53    disc    0    yes p(e)    1929  
 813                    64000.35m mgxsnp    end1-85    53    mult    0    yes p(e)    26292  
 814                    64152.50c endf5u    endf/b-v 1362    cont    300    no    5940  
 815                    64152.50d dre5    endf/b-v 1362    disc    300    no    10970  
 816                    64152.50c endf5t    endf/b-v 1362    cont    300    no    15879  
 817                    64152.50c endf5u    endf/b-v 1362    cont    300    no    15237  
 818                    64152.50d dre5    endf/b-v 1362    disc    300    no    32651  
 819                    64152.51c endf5t    endf/b-v 1362    cont    300    yes p(e)    49613  
 820                    64152.52c gd2hdcl(8)    hdcl    1362    cont    300    no    5971  
 821                    64152.53c gd2hdcl(8)    hdcl    1362    cont    300    no    11520  
 822                    64152.55c gd2gp(9)    gp. t-2    1362    cont    300    yes p(e)    59875  
 823                    64152.56c gd2gp(9)    gp. t-2    1362    cont    300    yes p(e)    59875  
 824                    64154.50c endf5u    endf/b-v 1364    cont    300    no    45006  
 825                    64154.50d dre5    endf/b-v 1364    disc    300    no    6569  
 826                    64154.51c endf5t    endf/b-v 1365    cont    300    no    11919  
 827                    64154.55c gd2gp(9)    gp. t-2    1364    cont    300    yes p(e)    59875  
 828                    64155.50c endf5u    endf/b-v 1365    cont    300    no    45006  
 829                    64155.50d dre5    endf/b-v 1365    disc    300    no    6569  
 830                    64155.51c endf5t    endf/b-v 1365    cont    300    no    11919  
 831                    64155.55c gd2gp(9)    gp. t-2    1365    cont    300    yes p(e)    59875

833 \*\* gd-156 \*\*  
 834 ---> 64156.50c endf5u endf/b-v 1366 cont 300 no 37412  
 835 64156.50d dre5 endf/b-v 1366 disc 300 no 6216  
 836 64156.51c endf5t endf/b-v 1366 cont 300 no 11443  
 837 64156.55c gdt2gp(9) gp. t-2 1366 cont 300 yes p(e) 44452  
 838 \*\* gd-157 \*\*  
 839 ---> 64157.50c endf5u endf/b-v 1367 cont 300 no 39016  
 840 64157.50d dre5 endf/b-v 1367 disc 300 no 6387  
 841 64157.51c endf5t endf/b-v 1367 cont 300 no 11365  
 842 64157.55c gdt2gp(9) gp. t-2 1367 cont 300 yes p(e) 47332  
 843 \*\* gd-158 \*\*  
 844 ---> 64158.50c endf5u endf/b-v 1368 cont 300 no 95917  
 845 64158.50d dre5 endf/b-v 1368 disc 300 no 5852  
 846 64158.51c endf5t endf/b-v 1368 cont 300 no 11975  
 847 64158.55c gdt2gp(9) gp. t-2 1368 cont 300 yes p(e) 13977  
 848 \*\* gd-160 \*\*  
 849 ---> 64160.50c endf5u endf/b-v 1370 cont 300 no 54029  
 850 64160.50d dre5 endf/b-v 1370 disc 300 no 5071  
 851 64160.51c endf5t endf/b-v 1370 cont 300 no 10021  
 852 64160.55c gdt2gp(9) gp. t-2 1370 cont 300 yes p(e) 65322  
 853  
 854 z = 67 \*\*\*\*\* holmium \*\*\*\*\*  
 855  
 856 \*\* ho-165 \*\*  
 857 67165.31c end179 end1-79 cont 0 no 44092  
 858 67165.31d dr179 end1-79 disc 0 no 3311  
 859 67165.35c rmccsa end1-85 54 cont 0 yes p(e) 54340  
 860 67165.35d drmccs end1-85 54 disc 0 yes p(e) 7080  
 861 ---> 67165.55c newxs group t-2 165 cont 300 yes p(e) 56666  
 862 ---> 67165.55d newxsd group t-2 165 disc 300 yes p(e) 42327  
 863 67165.55d newxsd group t-2 165 mult 300 yes p(e) 2526  
 864 67165.55m mgxsnp  
 865  
 866 z = 69 \*\*\*\*\* thulium \*\*\*\*\*  
 867  
 868 \*\* th-169 \*\*  
 869 69169.55c tm169(10) gp. t-2 ~~277~~ cont 300 no 47982  
 870  
 871  
 872 z = 72 \*\*\*\*\* hafnium \*\*\*\*\*  
 873  
 874 \*\* hf-nat \*\*  
 875 72000.35c end185 end1-85 55 cont 0 yes p(e) 75923  
 876 72000.50c newxs endf/b-v 1372 disc 300 no 52272  
 877 ---> 72000.50d newxsd endf/b-v 1372 disc 300 no 4792  
 878  
 879  
 880  
 881 z = 73 \*\*\*\*\* tantalum \*\*\*\*\*  
 882  
 883 \*\* ta-181 \*\*  
 884 73181.31c end179 end1-79 cont 0 no 20876  
 885 73181.31d dr179 end1-79 disc 0 no 5871  
 886 73181.35c end185 end1-85 56 cont 0 yes p(e) 33608  
 887 ---> 73181.50c endf5u endf/b-v 1285 disc 300 yes p(e) 60801  
 888 73181.50d dre5 endf/b-v 1285 mult 300 yes p(e) 16422  
 889 73181.50m mgxsnp endf/b-v 1285 cont 300 yes p(e) 2787  
 890 73181.51c rmccs endf/b-v 1285 disc 300 yes p(e) 21588  
 891 73181.51d drmccs  
 892  
 893  
 894 z = 74 \*\*\*\*\* tungsten \*\*\*\*\*  
 895 at \*\*

897	74000. 31c	endl179	endl-79	cont	0	no	
898	74000. 31d	dr179	endl-79	disc	0	no	
899	74000. 35c	endl185	endl-85	cont	0	yes p(e)	
900	-->	74000. 55c	raccs	group t-2	300	yes p(e)	
901	74000. 55d	drmccs	group t-2	disc	300	yes p(e)	
902	74000. 55m	mgxssnp	group t-2	4360	300	yes	
903	** w-182 **			mult	300	yes	
904	74182. 10c	bmcscs	endl/b-1v	1128	cont	0	yes p
905	74182. 10d	d9	endl/b-1v	1128	disc	0	yes p
906	74182. 50c	endlf5p	endl/b-v	1128	cont	300	yes p(e)
907	74182. 50d	dr5	endl/b-v	1128	disc	300	yes p(e)
908	74182. 51c	endlf5t	endl/b-v	1128	cont	300	yes p(e)
909	--> 74182. 55c	raccsa	group t-2	182	cont	300	yes p(e)
910	74182. 55d	drmccs	group t-2	disc	300	yes p(e)	
911	74182. 55m	mgxssnp	group t-2	182	mult	300	yes
912	** w-183 **				3687		
913	74183. 10c	bmcscs	endl/b-1v	1129	cont	0	yes p
914	74183. 10d	d9	endl/b-1v	1129	disc	0	yes p
915	74183. 50c	endlf5p	endl/b-v	1129	cont	300	yes p(e)
916	74183. 50d	dr5	endl/b-v	1129	disc	300	yes p(e)
917	74183. 51c	endlf5t	endl/b-v	1129	cont	300	yes p(e)
918	--> 74183. 55c	raccsa	group t-2	183	cont	300	yes p(e)
919	74183. 55d	drmccs	group t-2	183	disc	300	yes p(e)
920	74183. 55m	mgxssnp	group t-2	183	mult	300	yes
921	** w-184 **				3628		
922	74184. 10c	bmcscs	endl/b-1v	1130	cont	0	yes p
923	74184. 10d	d9	endl/b-1v	1130	disc	0	yes p
924	74184. 50c	endlf5p	endl/b-v	1130	cont	300	yes p(e)
925	74184. 50d	dr5	endl/b-v	1130	disc	300	yes p(e)
926	74184. 51c	endlf5t	endl/b-v	1130	cont	300	yes p(e)
927	--> 74184. 55c	raccsa	group t-2	184	cont	300	yes p(e)
928	74184. 55d	drmccs	group t-2	184	disc	300	yes p(e)
929	74184. 55m	mgxssnp	group t-2	184	mult	300	yes
930	** w-186 **				3664		
931	74186. 10c	bmcscs	endl/b-1v	1131	cont	0	yes p
932	74186. 10d	d9	endl/b-1v	1131	disc	0	yes p
933	74186. 50c	endlf5p	endl/b-v	1131	cont	300	yes p(e)
934	74186. 50d	dr5	endl/b-v	1131	disc	300	yes p(e)
935	74186. 51c	endlf5t	endl/b-v	1131	cont	300	yes p(e)
936	--> 74186. 55c	raccsa	group t-2	186	cont	300	yes p(e)
937	74186. 55d	drmccs	group t-2	186	disc	300	yes p(e)
938	74186. 55m	mgxssnp	group t-2	186	mult	300	yes
939					3672		
940							
941	z = 75	*****	rhenium	*****			
942							
943	** r@-185 **						
944	75185. 32c	m1scxs	endl-80	cont	0	yes p	
945	--> 75185. 35c	endl185	endl-85	cont	0	yes p(e)	
946	75185. 50c	raccsa	endl/b-v	1083	cont	300	no
947	75185. 50d	drmccs	endl/b-v	1083	disc	300	no
948	75185. 50m	mgxssnp	endl/b-v	1083	mult	300	no
949	** r@-187 **				1968		
950	75187. 32c	m1scxs	endl-80	cont	0	yes p	
951	--> 75187. 35c	endl185	endl-85	cont	0	yes p(e)	
952	75187. 50c	raccsa	endl/b-v	1084	cont	300	no
953	75187. 50d	drmccs	endl/b-v	1084	disc	300	no
954	75187. 50m	mgxssnp	endl/b-v	1084	mult	300	no
955					2061		
956							
957	z = 77	*****	iridium	*****			
958							
959							
960	*	ir-nat *					

2002

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961 77000.55c irnat(11) gp. t-2 cont cont 300 no 43112
962
963
964 z = 78 ****platinum***** platinum ***** ****
965
966 ** pt-nat **
967 78000.31c end179 endl-79 cont 0 no 10657
968 78000.31d dr179 endl-79 disc 0 no 3209
969 ---> 78000.35c rmccsa endl-85 . 60 cont 0 yes p(e) 15432
970 78000.35d drmccs endl-85 60 disc 0 yes p(e) 6994
971 78000.35m mgxsnp endl-85 60 mult 0 yes 1929
972
973 z = 79 ****gold***** gold ****
974
975
976 ** au-197 **
977 79197.31c end179 endl-79 cont 0 no 25040
978 79197.31d dr179 endl-79 disc 0 no 3965
979 79197.35c end185 endl-85 61 cont 0 yes p(e) 31932
980 79197.50c endf5p endf/b-v 1379 disc 300 139466
981 79197.50d dres5 endf/b-v 1379 disc 300 no 4923
982 79197.51c endf5t endf/b-v 1379 cont 300 no 12283
983 79197.55c rmccsa group t-2 1379 cont 300 yes p(e) 134386
984 ---> 79197.55d drmccs group t-2 1379 disc 300 yes p(e) 7944
985 79197.56c newxs group t-2 197 cont 300 yes p(e) 122543
986 79197.56d newxs group t-2 197 disc 300 yes p(e) 38862
987 79197.56m mgxsnp group t-2 197 mult 300 yes 3490
988
989 z = 82 ****lead***** lead ****
990
991
992 ** pb-nat **
993 82000.10c bmccs endf/b-1v 1288 cont 0 yes p 21052
994 82000.10d d9 endf/b-1v 1288 disc 0 yes p 11526
995 82000.31c end179 endl-79 cont 0 no 3964
996 82000.31d dr179 endl-79 disc 0 no 3383
997 82000.35c end185 endl-85 62 cont 0 yes p(e) 6700
998 ---> 82000.50c rmcccs endf/b-v 1382 cont 300 yes p(e) 37694
999 82000.50d drmccs endf/b-v 1382 disc 300 yes p(e) 20710
1000 82000.50m mgxsnp endf/b-v 1382 mult 300 yes 3384
1001 82000.51c endf5t endf/b-v 1382 cont 300 yes p(e) 37694
1002
1003 z = 83 ****bismuth***** bismuth ****
1004
1005
1006 ** bi-209 **
1007 ---> 83209.35c end185 endl-85 cont 0 yes p(e) 18377
1008 ---> 83209.50c endf5u endf/b-v 1375 cont 300 yes p(e) 15000
1009 83209.50d dres5 endf/b-v 1375 disc 300 yes p(e) 7577
1010 83209.50m mgxsnp endf/b-v 1375 mult 300 yes 2524
1011 83209.51c rmccs endf/b-v 1375 cont 300 yes p(e) 13782
1012 83209.51d drmccs endf/b-v 1375 disc 300 yes p(e) 7577
1013
1014 z = 90 ****thorium***** thorium ****
1015
1016
1017 ** th-231 **
1018 90231.35c end185 endl-85 64 cont 0 yes p(e) 9218 prompt
1019 ** th-232 **
1020 90232.31c end179 endl-79 cont 0 no 40220 prompt
1021 90232.31d dr179 endl-79 disc 0 no 4045 prompt
1022 90232.35c end185 endl-85 65 cont 0 yes p(e) 56152 both
1023 ---> 90232.50c endf5u endf/b-v 1390 cont 300 yes p(e) 152843 both
1024 ---> 90232.50d dres5 endf/b-v 1390 disc 300 yes p(e) 111998 both

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1025	90232. 50m	mgxssp	endlf/b-v	1390	mult	300	yes	2896	both
1026	90232. 51c	rmcscs	endlf/b-v	1390	cont	300	yes p(e)	17986	both
1027	90232. 51d	drmcscs	endlf/b-v	1390	disc	300	yes p(e)	11988	both
1028	** th-233 **								
1029	90233. 35c	endl185	endl-85	67	cont	0	yes p(e)	19231	prompt
1030	91233. 50m	mgxssp	endlf/b-v	1391	disc	300	no	19560	total
1031	91233. 51c	rmccs	endlf/b-v	1391	mult	300	no	3741	total
1032	91233. 51d	drmcscs	endlf/b-v	1391	cont	300	no	1970	total
1033	z = 91	***** protactinium *****							
1034	** pa-231 **								
1035	91231. 50c	pa231(12)	endlf/b-v	8131	cont	300	no	7066	total
1036	** pa-233 **								
1037	91233. 35c	endl185	endl-85	67	cont	0	yes p(e)	19231	prompt
1038	----> 91233. 50c	endlf5u	endlf/b-v	1391	disc	300	no	19560	total
1039	91233. 50d	dres5	endlf/b-v	1391	mult	300	no	3741	total
1040	91233. 50m	mgxssp	endlf/b-v	1391	cont	300	no	1970	total
1041	91233. 51c	rmccs	endlf/b-v	1391	disc	300	no	5682	total
1042	91233. 51d	drmcscs	endlf/b-v	1391	cont	300	no	3741	total
1043	91233. 51d	drmcscs	endlf/b-v	1391	disc	300	no		
1044	z = 92	***** uranium *****							
1045	92233. 31c	endl179	endl-79	69	cont	0	no	22575	prompt
1046	92233. 31d	dr179	endlf/b-v	1393	disc	0	no	4029	prompt
1047	** u-233 **								
1048	92233. 31c	endl179	endl-79	68	cont	0	yes p(e)	29735	prompt
1049	92233. 31d	dr179	endlf/b-v	1393	disc	300	no	18856	both
1050	92233. 35c	endl185	endl-85	68	cont	300	no	4213	both
1051	92233. 50c	rmccs	endlf/b-v	1393	disc	300	no	1988	both
1052	92233. 50d	drmcscs	endlf/b-v	1393	mult	300	no	7764	both
1053	92233. 50m	mgxssp	endlf/b-v	1393	cont	300	no		
1054	92233. 51c	endlf5t	endlf/b-v	1393	disc	300	no		
1055	** u-234 **								
1056	92234. 31c	endl179	endl-79	69	cont	0	no	4033	prompt
1057	92234. 31d	dr179	endlf/b-v	1394	disc	0	no	4311	prompt
1058	92234. 35c	endl185	endl-85	69	cont	0	yes p(e)	9618	prompt
1059	----> 92234. 50c	endlf5p	endlf/b-v	1394	disc	300	no	89474	total
1060	92234. 50d	dres5	endlf/b-v	1394	disc	300	no	4874	total
1061	92234. 50m	mgxssp	endlf/b-v	1394	mult	300	no	2150	total
1062	92234. 51c	rmccs	endlf/b-v	1394	cont	300	no	6467	total
1063	92234. 51d	drmcscs	endlf/b-v	1394	disc	300	no	4874	total
1064	** u-235 **								
1065	92235. 04c	xmcscs	endlf/b-v	1261	cont	3000	yes h	29516	both
1066	92235. 05c	xmcscs	endlf/b-v	1261	cont	30000	yes h	18573	both
1067	92235. 06c	xmcscs	endlf/b-v	1261	cont	6.e+05	yes h	12560	both
1068	92235. 07c	xmcscs	endlf/b-v	1261	cont	1.2e+07	yes h	11268	both
1069	92235. 08c	xmcscs	endlf/b-v	1261	cont	0	yes h	42923	both
1070	92235. 09c	xmcscs	endlf/b-v	1261	cont	300	yes h	41638	both
1071	92235. 10c	xmcscs	endlf/b-v	1261	cont	0	yes p	42716	both
1072	92235. 10d	d9	endlf/b-v	1261	disc	0	yes p	7412	both
1073	92235. 11c	amccs	endlf/b-v	1261	cont	300	yes p	14332	both
1074	92235. 11d	d9	endlf/b-v	1261	disc	300	yes p	7412	both
1075	92235. 15c	rmccsb	endlf/b-v	1261	cont	1.2e+07	yes p(e)	15173	both
1076	92235. 15d	d9	endlf/b-v	1261	disc	1.2e+07	yes p(e)	11406	both
1077	92235. 18c	amccs	endlf/b-v	1261	cont	3000	yes p	29254	both
1078	92235. 18d	d9	endlf/b-v	1261	disc	0	no	19132	prompt
1079	92235. 19c	rmccsb	endlf/b-v	1261	cont	3000	yes p(e)	7412	both
1080	92235. 19d	d9	endlf/b-v	1261	disc	30000	yes p(e)	22298	both
1081	92235. 20c	amccs	endlf/b-v	1261	cont	6.e+05	yes p	11406	both
1082	92235. 20d	d9	endlf/b-v	1261	disc	6.e+05	yes p	7412	both
1083	92235. 31c	endl179	endl-79	cont	0	no	19132	prompt	
1084	92235. 31d	dr179	endlf/b-v	1395	disc	0	no	4638	prompt
1085	----> 92235. 50c	rmccs	endlf/b-v	1395	cont	300	yes p(e)	60550	both
1086	92235. 50d	drmcscs	endlf/b-v	1395	disc	300	yes p(e)	11849	both
1087	92235. 50m	mgxssp	endlf/b-v	1395	mult	300	yes p(e)	3164	both
1088	92235. 51c	endlf5t	endlf/b-v	1395	cont	300	yes p(e)	25862	both

1089	92235.52c	u600k	endf/b-v	1395	cont	600	yes p(e)	65347
1090	92235.53c	apr xs	endf/b-v	1395	cont	600	yes p(e)	36120
1091	92235.54c	aprixs	endf/b-v	1395	cont	900	yes p(e)	36008
1092	92235.56c	endf5ht	endf/b-v	1395	cont	1.2e+04	yes p(e)	28555
1093	92235.57c	endf5ht	endf/b-v	1395	cont	1.2e+05	yes p(e)	25275
1094	92235.58c	endf5ht	endf/b-v	1395	cont	1.2e+06	yes p(e)	23027
1095	92235.59c	endf5ht	endf/b-v	1395	cont	1.2e+07	yes p(e)	22467
1096	** U-236 **							both
1097	92236.31c	end179	endl-79	79	cont	0	no	4023
1098	92236.31d	dr179	endl-79	79	disc	0	no	4350
1099	92236.35c	end185	endl-85	71	cont	0	yes p(e)	prompt
1100	--> 92236.50c	endf5p	endl-85	72	cont	300	no	9760
1101	92236.50d	dres5	endl/b-v	1396	disc	300	yes p(e)	138756
1102	92236.50m	mgxsnp	endl/b-v	1396	mult	300	no	total
1103	92236.51c	rmcccs	endl/b-v	1396	cont	300	no	2166
1104	92236.51d	drmccs	endl/b-v	1396	disc	300	no	total
1105	** U-237 **							total
1106	92237.31c	end179	endl-79	79	cont	0	no	4549
1107	92237.31d	dr179	endl-79	79	disc	0	no	3986
1108	92237.35c	end185	endl-85	72	cont	0	yes p(e)	prompt
1109	--> 92237.50c	endf5p	endl/b-v	8237	cont	300	yes p(e)	9425
1110	92237.50d	dres5	endl/b-v	8237	disc	300	yes p(e)	32506
1111	92237.50m	mgxsnp	endl/b-v	8237	mult	300	yes p(e)	total
1112	92237.51c	rmcccs	endl/b-v	8237	cont	300	yes p(e)	2174
1113	92237.51d	drmccs	endl/b-v	8237	disc	300	yes p(e)	total
1114	** U-238 **							total
1115	92238.04c	xmccs	endlf/b-tv	1262	cont	30000	yes h	32918
1116	92238.05c	xmccs	endlf/b-tv	1262	cont	6.e+05	yes h	18803
1117	92238.06c	xmccs	endlf/b-tv	1262	cont	1.2e+07	yes h	10399
1118	92238.12c	umccs	endlf/b-tv	1262	cont	300	yes p(e)	both
1119	92238.13c	rmccsb	endlf/b-tv	1262	cont	30000	yes p(e)	both
1120	92238.13d	d9	endlf/b-tv	1262	disc	30000	yes p(e)	12905
1121	92238.15c	rmccsb	endlf/b-tv	1262	cont	1.2e+07	yes p(e)	both
1122	92238.15d	d9	endlf/b-tv	1262	disc	1.2e+07	yes p(e)	16230
1123	92238.15m	amccs	endlf/b-tv	1262	cont	6.e+05	yes p(e)	13045
1124	92238.20d	d9	endlf/b-tv	1262	disc	6.e+05	yes p(e)	18721
1125	92238.31c	end179	endl-79	79	cont	0	no	7034
1126	92238.31d	dr179	endl-79	79	disc	0	no	18324
1127	92238.35c	end185	endl-85	73	cont	0	yes p(e)	prompt
1128	--> 92238.50d	drmccs	endlf/b-v	1398	cont	300	yes p(e)	27229
1129	92238.50m	mgxsnp	endlf/b-v	1398	disc	300	yes p(e)	both
1130	92238.51c	endf5t	endlf/b-v	1398	mult	300	yes p(e)	3553
1131	92238.52c	u600k	endlf/b-v	1398	cont	600	yes p(e)	both
1132	92238.53c	apr1xs	endlf/b-v	1398	cont	600	yes p(e)	123260
1133	92238.54c	apr1xs	endlf/b-v	1398	cont	900	yes p(e)	160107
1134	92238.56c	endf5ht	endlf/b-v	1398	cont	1.2e+04	yes p(e)	both
1135	92238.57c	endf5ht	endlf/b-v	1398	cont	1.2e+05	yes p(e)	82531
1136	92238.58c	endf5ht	endlf/b-v	1398	cont	1.2e+06	yes p(e)	47267
1137	92238.59c	endf5ht	endlf/b-v	1398	cont	1.2e+07	yes p(e)	27875
1138	** U-239 **							both
1139	--> 92239.35c	rmccsa	endl-85	74	cont	0	yes p(e)	9870
1140	92239.35d	drmccs	endl-85	74	disc	0	yes p(e)	prompt
1141	92239.35m	mgxsnp	endl-85	74	mult	0	yes	9347
1142	** U-240 **							prompt
1143	92240.31c	end179	endl-79	75	cont	0	no	2147
1144	92240.31d	dr179	endl-79	75	disc	0	no	4238
1145	92240.35c	end185	endl-85	75	cont	0	yes p(e)	prompt
1146	--> 92240.35c							9556
1147								
1148	z = 93	*****						
1149								
1150	** 3D-235 **							
1151	** 3D-35c	end185	end1-85	76	cont	0	yes p(e)	9551
1152								

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1153    \*\* np-236 \*\*    93236. 35c    end185    endl-85    77    cont    0    yes p(•)    9882    prompt  
 1154    -->    93237. 35c    end185    endl-85    77    cont    0    no    14149    total  
 1155    \*\*    np-237 \*\*    93237. 31c    end179    endl-79    disc    0    no    4032    total  
 1156    93237. 31d    dr179    endl-79    disc    0    yes p(•)    20286    prompt  
 1157    93237. 35c    end185    endl-85    78    cont    0    no    63264    total  
 1158    93237. 50c    endf5p    endl-85    78    cont    300    no    5308    total  
 1159    93237. 50d    dr5    endl-85    78    cont    300    no    9787    total  
 1160    93237. 50d    dr5    endl-85    78    cont    300    no    32599    both  
 1161    93237. 51c    endf5t    endl-85    78    cont    300    no    20525    both  
 1162    -->    93237. 55c    rmcas    group t-2    1337    cont    300    no    2812    both  
 1163    93237. 55d    drmcas    group t-2    1337    disc    300    no    2812    both  
 1164    93237. 55m    mgxasp    group t-2    1337    mult    300    no    2812    both  
 1165    \*\*    np-238 \*\*    93238. 35c    end185    endl-85    79    cont    0    yes p(•)    9939    prompt  
 1166    93238. 35c    end185    endl-85    79    cont    0    yes p(•)    9939    prompt  
 1167    93238. 35c    end185    endl-85    79    cont    0    yes p(•)    9939    prompt  
 1168    93238. 35c    end185    endl-85    79    cont    0    yes p(•)    9939    prompt  
 1169    z = 94    \*\*\*\*\* plutonium \*\*\*\*\*  
 1170    94237. 35c    end185    endl-85    80    cont    0    yes p(•)    11361    prompt  
 1171    \*\*    pu-237 \*\*    94237. 35c    end185    endl-85    80    cont    0    yes p(•)    8624    prompt  
 1172    \*\*    pu-238 \*\*    94238. 31c    end179    endl-79    disc    0    no    3901    prompt  
 1173    \*\*    pu-238 \*\*    94238. 31d    dr179    endl-79    disc    0    yes p(•)    15680    prompt  
 1174    ,    94238. 31d    dr179    endl-79    disc    300    no    18804    total  
 1175    ,    94238. 35c    end185    endl-85    81    cont    300    no    5445    total  
 1176    ,    94238. 35c    end185    endl-85    81    cont    300    no    2442    total  
 1177    -->    94238. 50c    endf5p    endl-85    81    cont    300    no    6108    total  
 1178    94238. 50d    dr5    endl-85    81    cont    300    no    5445    total  
 1179    94238. 50m    mgxasp    endl-85    81    cont    300    no    5445    total  
 1180    94238. 51c    rmcas    endl-85    81    cont    300    no    5445    total  
 1181    94238. 51d    drmcas    endl-85    81    cont    300    no    5445    total  
 1182    \*\*    pu-239 \*\*    94239. 02c    xmcas    endl/b-1v    1264    cont    3000    yes h    40464    both  
 1183    94239. 02c    xmcas    endl/b-1v    1264    cont    3000    yes h    25460    both  
 1184    94239. 03c    xmcas    endl/b-1v    1264    cont    6.e+05    yes h    13633    both  
 1185    94239. 04c    xmcas    endl/b-1v    1264    cont    1.2e+07    yes h    11349    both  
 1186    94239. 05c    xmcas    endl/b-1v    1264    cont    0    yes h    41167    both  
 1187    94239. 06c    xmcas    endl/b-1v    1264    cont    0    yes h    34659    both  
 1188    94239. 07c    xmcas    endl/b-1v    1264    cont    300    yes h    1.2e+07    yes p(•)    14205    both  
 1189    94239. 15c    rmcbs    endl/b-1v    1264    cont    1.2e+07    yes p(•)    11541    both  
 1190    94239. 15d    d9    endl/b-1v    1264    cont    3000    yes p(•)    40421    both  
 1191    94239. 16c    amcas    endl/b-1v    1264    cont    0    yes p(•)    41153    both  
 1192    94239. 16d    d9    endl/b-1v    1264    cont    0    yes p(•)    8056    both  
 1193    94239. 17c    amcas    endl/b-1v    1264    cont    300    yes p(•)    34631    both  
 1194    94239. 17d    d9    endl/b-1v    1264    cont    300    yes p(•)    8056    both  
 1195    94239. 18c    amcas    endl/b-1v    1264    cont    3000    yes p(•)    40421    both  
 1196    94239. 18d    d9    endl/b-1v    1264    cont    3000    yes p(•)    8056    both  
 1197    94239. 19c    rmcbs    endl/b-1v    1264    cont    30000    yes p(•)    28311    both  
 1198    94239. 19d    d9    endl/b-1v    1264    cont    30000    yes p(•)    11541    both  
 1199    94239. 20c    amcas    endl/b-1v    1264    cont    6.e+05    yes p(•)    13590    both  
 1200    94239. 20d    d9    endl/b-1v    1264    cont    6.e+05    yes p(•)    8056    both  
 1201    94239. 31c    end179    endl-79    disc    0    no    20976    prompt  
 1202    94239. 31d    dr179    endl-79    disc    0    no    5926    prompt  
 1203    94239. 50c    endf5p    endl-79    1399    cont    300    yes p(•)    74110    both  
 1204    94239. 50d    dr5    endl-79    1399    disc    300    yes p(•)    12692    both  
 1205    94239. 51c    endf5t    endl-79    1399    cont    300    yes p(•)    18898    both  
 1206    -->    94239. 55c    rmcas    group t-2    1399    cont    300    yes p(•)    102160    both  
 1207    94239. 55d    drmcas    group t-2    1399    disc    300    yes p(•)    20788    both  
 1208    94239. 55m    mgxasp    group t-2    1399    mult    300    yes p(•)    3038    both  
 1209    94239. 56c    endf5ht    group t-2    1399    cont    1.2e+04    yes p(•)    45590    both  
 1210    94239. 57c    endf5ht    group t-2    1399    cont    1.2e+05    yes p(•)    36262    both  
 1211    94239. 58c    endf5ht    group t-2    1399    cont    1.2e+06    yes p(•)    31110    both  
 1212    94239. 59c    endf5ht    group t-2    1399    cont    1.2e+07    yes p(•)    29822    both  
 1213    \*\*    pu-240 \*\*    94240. 12c    brccs    endl/b-1v    1265    cont    900    yes p(•)    41821    both  
 1214    94240. 12d    d9    endl/b-1v    1265    disc    900    yes p(•)    6087    both  
 1215    94240. 31c    end179    endl-79    cont    0    no    33109    prompt



1281	---	96242.50c	endf5u	endl/b-v	8642	cont	300	yes p(e)	30958	total
1282	-->	96242.50d	dres5	endl/b-v	8642	disc	300	yes p(e)	8964	total
1283		96242.50m	mgxamp	endl/b-v	8642	mult	300	no	1970	total
1284		96242.51c	rmcsc	endl/b-v	8642	cont	300	yes p(e)	9828	total
1285		96242.51d	drmcsc	endl/b-v	8642	disc	300	yes p(e)	8964	total
1286	**	cm-243 **								
1287		96243.35c	endl85	endl-85	91	cont	0	yes p(e)	21638	prompt
1288	**	cm-244 **								
1289		96244.31c	endl79	endl-79		cont	0	no	15126	total
1290		96244.31d	dr179	endl-79		disc	0	no	4290	total
1291		96244.35c	endl85	endl-85	92	cont	0	yes p(e)	21257	prompt
1292	---	96244.50c	endf5u	endl/b-v	1344	cont	300	yes p(e)	46052	total
1293		96244.50d	dres5	endl/b-v	1344	disc	300	yes p(e)	9570	total
1294		96244.50m	mgxamp	endl/b-v	1344	mult	300	no	1950	total
1295		96244.51c	rmcsc	endl/b-v	1344	cont	300	yes p(e)	10908	total
1296		96244.51d	drmcsc	endl/b-v	1344	disc	300	yes p(e)	9570	total
1297	**	cm-245 **								
1298		96245.35c	endl85	endl-85	93	cont	0	yes p(e)	24189	prompt
1299		96245.50c	cm245(13)	endl/b-v	1345	cont	300	yes p(e)	11664	total
1300	---	96245.52c	cm245(13)	ndfb-v.2	1345	cont	300	yes p(e)	21314	both
1301	**	cm-246 **								
1302		96246.35c	endl85	endl-85	94	cont	0	yes p(e)	12550	prompt
1303	**	cm-247 **								
1304		96247.35c	endl85	endl-85	95	cont	0	yes p(e)	20326	prompt
1305	**	cm-248 **								
1306		96248.35c	endl85	endl-85	96	cont	0	yes p(e)	18239	prompt
1307										
1308		z = 97	*****	berkelium	*****					
1309										
1310		** bk-249 **								
1311		97249.35c	endl85	endl-85	97	cont	0	yes p(e)	11844	prompt
1312										
1313										
1314										
1315	z = 98	*****	californium	*****	*****	*****				
1316										
1317	**	cf-249 **								
1318		98249.35c	endl85	endl-85	98	cont	0	yes p(e)	28116	prompt
1319	**	cf-250 **								
1320		98250.35c	endl85	endl-85	99	cont	0	yes p(e)	10548	prompt
1321	**	cf-251 **								
1322		98251.35c	endl85	endl-85	100	cont	0	yes p(e)	11030	prompt
1323	**	cf-252 **								
1324		98252.35c	endl85	endl-85	101	cont	0	yes p(e)	17969	prompt
1325	1									
1326										
1327		zaid - the zaid is the nuclide identification number with the form zzzaaa.mnc or zzzzaa.mnd								
1328		where zzz is the atomic number								
1329		aaa is the mass number (000 for naturally occurring elements)								
1330		nn is the neutron cross-section set identifier								
1331		c indicates continuous energy								
1332		d indicates discrete reaction								
1333										
1334										
1335		file - one of our nuclear-data libraries. the number in parentheses following a file name refers to one of the special notes below.								
1336		source - indicates where the particular evaluation originated:								
1337										
1338										
1339										
1340										
1341										
1342										
1343										
1344										

zaid - the zaid is the nuclide identification number with the form  
zzzaaa.mnc or zzzzaa.mnd

where zzz is the atomic number  
aaa is the mass number (000 for naturally  
occurring elements)

nn is the neutron cross-section set identifier  
c indicates continuous energy  
d indicates discrete reaction

file - one of our nuclear-data libraries. the number in parentheses  
following a file name refers to one of the special notes below.

source - indicates where the particular evaluation originated:

zzzaaa.mnc (versions iv and v) is the evaluated nuclear data  
file which is an american effort coordinated by the national  
nuclear data center at brookhaven national laboratory. the  
evaluations are updated periodically by evaluators from all over the

country.

- 1345        1346        endl (79, 80 and 85) is the evaluated nuclear data library  
1347        1348        compiled by r.j.howerton and his nuclear data group at the lawrence  
1349        1350        livermore national laboratory. the number indicates from which year's  
1351        1352        library a particular evaluation was taken.  
1353        1354        lasl-sub - the los alamos sublibrary is a collection of special  
evaluations prepared by the nuclear data group (t-2) at los alamos.  
1355        1356        foster - special evaluations representative of the average  
fission products for u-235 and pu-239. this work was carried out in  
group t-2.  
1357        1358        group t-2 - recently completed evaluations of selected isotopes  
prepared in group t-2 at los alamos. sometimes abbreviated gp. t-2  
1359        1360        mat - for endf/b, mat is the material identifier for a particular  
evaluation. for the endl-85 library, a mat was  
assigned for each nuclide to be compatible with endf/b procedures.  
1361        1362        endl-79 and 80 contain no mat identifiers.  
1363        1364        type - cont indicates a continuous-energy cross-section set  
disc indicates a discrete-reaction cross-section set  
mult indicates a multigroup cross-section set  
1365        1366        temp - the temperature (in degrees kelvin) at which the data were  
processed. the temperature enters into the processing only through  
the doppler broadening of cross sections. doppler broadening, in  
the current context, refers to a change in cross section resulting  
from thermal motion (translation, rotation, and vibration) of nuclei  
in a target material. doppler broadening is done on all cross  
sections for incident neutron (nonrelativistic energies) on a target  
at some temperature (temp) in which the free-atom approximation is  
valid.  
1367        1368        in general, an increase in the temperature of the material  
containing neutron-absorbing nuclei in a homogeneous system results  
in doppler broadening of resonances and an increase in resonance  
absorption. furthermore, a constant cross section at zero degrees goes  
to 1/v behavior as the temperature increases. you should not only employ  
the best evaluations but also employ evaluations which are at  
temperatures approximating temperatures in your application.  
contact x-6 for guidance or generation of specific temperature  
libraries. all endf/b-v evaluations on the standard libraries were  
1369        1370        processed at room temperature (300 degrees kelvin).  
1371        1372        gpd - "yes" means that gamma-production data exist: "no" means that such  
data do not exist. between sets with gamma-production data there is  
1373        1374        a further distinction represented as follows: "p" indicates sets  
with a pointwise representation of the energy dependence of the  
gamma-production cross section; "h" indicates that the energy  
dependence of the gamma-production cross section is represented as a  
histogram over 30 energy groups. the "h" type of representation is  
1375        1376        found on cross-section sets processed before 1977, approximately.  
before that time, gamma-production information was incorporated into  
1377        1378        mcnp calculations using gamma-production matrices calculated in a 30  
neutron group and 12 gamma group structure. when the ace format was  
1379        1380        changed, the total cross section was calculated from the matrices  
and used in histogram form in order that old problems could track.  
1381        1382        in the case of discrete cross-section sets in table 1, the "p" or  
"h" refers to the type of data in the original file before  
1383        1384        processing into discrete form. those materials which have  
1385        1386        photon-production information given in expanded ace  
1387        1388        format (see 2d newsletter) are indicated with the notation (e).

1409  
1410 length - the total length of a particular cross-section file in decimal. it  
1411 is understood that the actual storage requirement in an mcnp problem  
1412 will often be less because certain data unneeded for a problem will  
1413 be deleted.  
1414  
1415 nubar - for fissionable material, nubar indicates the type of fission nu data  
1416 available. prompt means that only prompt nu data are given; total  
1417 means that only total nu data are given; both means that prompt and  
1418 total nu are given.  
1419  
1420 arrow - the arrow which precedes certain nuclides listed in the table indicates  
1421 what we believe to be the best available evaluation. the user should  
1422 note that because of size limitations on public files, the evaluation  
1423 designated by the arrow may not necessarily be the default evaluation.  
1424  
1425  
1426  
1427                           s p e c i a l                 n o t e s  
1428  
1429 note 1. when performing calculations utilizing neutron-neutron cross sections,  
1430 it is essential to incorporate the effects of motion of the target neutron.  
1431 this capability does not exist today in mcnp. this limitation makes the  
1432 use of the neutron-neutron cross sections unadvisable for most applications.  
1433 reference: r.c.little and r.e.seamon, "additional neutron cross-section  
1434 tables for mcnp," los alamos national laboratory internal memorandum  
1435 x-6:rcl/res-85-288 to distribution (june 3, 1985).  
1436  
1437 note 2. these endf/b-iv sets are recommended without reservation. they  
1438 include photon-production data in expanded ace format.  
1439 reference: r.c.little, "endf/b-iv cross sections for mcnp," los alamos  
1440 national laboratory internal memorandum x-6:rcl-84-251 to t.e.booth  
1441 (november 21, 1984).  
1442  
1443 note 3. photon production added to endf/b-v neutron files by r.e.macfarlane,  
1444 t-2, with intent to estimate photon heating roughly.  
1445 reference: r.c.little, "argon and krypton cross-section files," los  
1446 alamos national laboratory internal memorandum to p.d.soran  
1447 (june 30, 1982).  
1448  
1449 note 4. these data are valid to 5 mev; they were extended to 20 mev for  
1450 completeness only.  
1451 reference: r.c.little, "sc-45 cross sections for mcnp," los alamos  
1452 national laboratory internal memorandum x-6:rcl-85-430 to  
1453 c.d.bowman (august 27, 1985).  
1454  
1455 note 5. the evaluation was performed by c.y.fu and d.m.hetrick at oak ridge,  
1456 who refer to it as mat 1326, mod 4.  
1457 reference: r.c.little, "monte carlo cross sections for fe based on  
1458 ornl evaluation," los alamos national laboratory internal memorandum  
1459 x-6:rcl-86-436 to p.p.whalen (october 3, 1986).  
1460  
1461 note 6. these data were taken from incomplete fission-product evaluations.  
1462 reference: r.c.little, "cross sections in ace format for various ip  
1463 target materials," los alamos national laboratory internal  
1464 memorandum to d.davidson (august 19, 1982).  
1465  
1466 note 7. this is endf/b-v after modification by evaluator to get better  
1467 agreement with endf85.  
1468 references: r.c.little, "y-89 cross sections for mcnp," los alamos  
1469 national laboratory internal memorandum x-6:rcl-85-419 to distribution  
1470 (august 16, 1985);  
1471 r.c.little, "modified endf/b-v y-89 cross sections for mcnp," los alamos  
1472 national laboratory internal memorandum x-6:rcl-85-443 to distribution

1473 (september 6, 1985).

- 1474 note 8. this is endf/b-v after modification by evaluator to get better  
1475 agreement with Japanese measurements.  
1476 reference: r.c.little, "revised gd-152 evaluation from nedl," los alamos  
1477 national laboratory internal memorandum x-6:rcl-87-132 to distribution  
1478 (march 24, 1987).  
1479  
1480 note 9. photon-production data were added to endf/b-v neutron cross sections  
1481 by p.g.young, t-2. these data are valid to 1 mev only.  
1482 reference: r.c.little and r.e.seaman, "endf/b-v gd cross sections with  
1483 photon production," los alamos national laboratory internal memorandum  
1484 x-6:rcl/res-86-30 to a.r.larson (january 22, 1986).  
1485  
1486 note 10. this has to do with file tm1693. i have no reference for this file.  
1487 the file itself was first written on 86/09/29.  
1488  
1489 note 11. this has to do with file irnatt3. i have no reference for this file.  
1490 the file itself was first written on 86/09/19.  
1491  
1492 note 12. this has to do with file pa2313. i have no reference for this file.  
1493 the file itself was first written on 88/01/25.  
1494  
1495 note 13. very little detail was given in the original endf/b-v  
1496 evaluation for cm-245. the updated evaluation available  
1497 under endf/b-v revision 2 is very complete. the two sets are  
1498 compared in little's memo x-6:rcl-86-220.  
1499 reference: r.c.little, "monte carlo cross sections for cm-245,"  
1500 los alamos national laboratory internal memorandum  
1501 x-6:rcl-86-220 to j.t.west (june 3, 1986).  
1502  
1503